US008089461B2

(12) **United States Patent**
Beard et al.

(10) **Patent No.: US 8,089,461 B2**
(45) **Date of Patent: Jan. 3, 2012**

(54) **TOUCH WAKE FOR ELECTRONIC DEVICES**

(75) Inventors: **Paul Beard**, Milipitas, CA (US); **Ryan Winfield Woodings**, Boise, ID (US)

(73) Assignee: **Cypress Semiconductor Corporation**

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 939 days.

(21) Appl. No.: **11/166,622**

(22) Filed: **Jun. 23, 2005**

(65) **Prior Publication Data**

US 2006/0294523 A1 Dec. 28, 2006

(51) **Int. Cl.**
G09G 5/08 (2006.01)
G06F 3/041 (2006.01)

(52) **U.S. Cl.** **345/163**; 345/169; 345/173

(58) **Field of Classification Search** 345/163, 345/169, 173
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,725,804	A	4/1973	Langan
3,740,588	A	6/1973	Stratton et al.
3,810,036	A	5/1974	Bloedom
3,831,113	A	8/1974	Ahmed
3,845,328	A	10/1974	Hollingsworth
3,940,760	A	2/1976	Brokaw
4,061,987	A	12/1977	Nagahama
4,134,073	A	1/1979	MacGregor
4,138,671	A	2/1979	Comer et al.
4,176,258	A	11/1979	Jackson
4,250,464	A	2/1981	Schade, Jr.
4,272,760	A	6/1981	Prazak et al.
4,283,713	A	8/1981	Phillipp
4,326,135	A	4/1982	Jarrett et al.
4,344,067	A	8/1982	Lee
4,438,404	A	3/1984	Phillipp
4,475,151	A	10/1984	Phillipp
4,497,575	A	2/1985	Phillipp
4,608,502	A	8/1986	Dijkmans et al.
4,656,603	A	4/1987	Dunn
4,670,838	A	6/1987	Kawata
4,689,740	A	8/1987	Moelands et al.

(Continued)

FOREIGN PATENT DOCUMENTS

DE	19710829	A1	9/1998

(Continued)

OTHER PUBLICATIONS

USPTO Notice of Allowance for U.S. Appl. No. 10/238,966 dated Jan. 27, 2009; 4 pages.

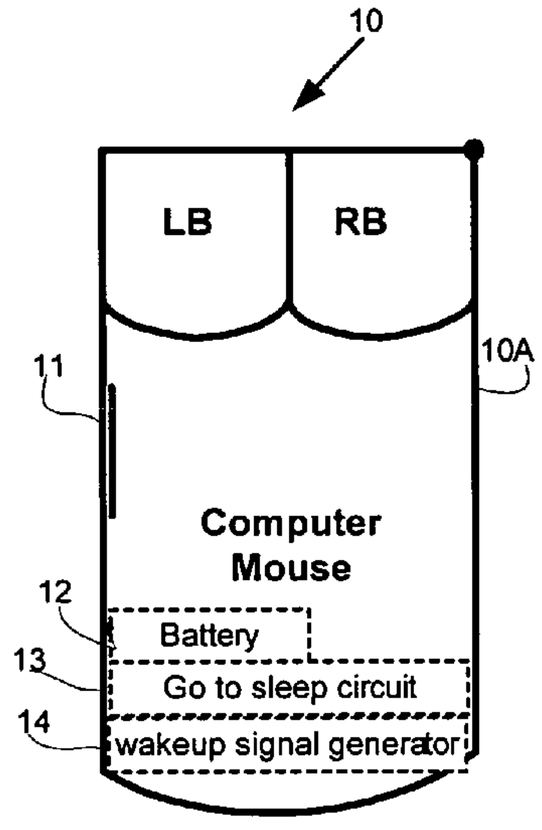
(Continued)

Primary Examiner — Amr Awad
Assistant Examiner — Randal Willis

(57) **ABSTRACT**

A system to generate a wakeup signal for a low power device: The system includes a capacitor, the capacitance of which changes when a user touches the device by placing a finger or hand near a certain location on the device. The capacitor is cyclically charged to a pre-established value and then discharged. The time required to charge and discharge the capacitor is a function of the capacitor size and thus, a function of whether or not the operator is touching the device. The number of charge-discharge cycles that occur in a certain period of time is counted. If the number is relatively small, it indicated that a user is touching the device and a wake signal is generated. If the number is relatively large, it means that the user is not touching the device and no wake signal is generated. Thus, in the embodiments shown, a wake signal is generated when the operator touches the device.

18 Claims, 4 Drawing Sheets



U.S. PATENT DOCUMENTS

4,692,718	A	9/1987	Roza et al.
4,727,541	A	2/1988	Mori et al.
4,736,097	A	4/1988	Phillipp
4,740,966	A	4/1988	Goad
4,755,766	A	7/1988	Metz
4,773,024	A	9/1988	Faggin et al.
4,794,558	A	12/1988	Thompson
4,802,103	A	1/1989	Faggin et al.
4,802,119	A	1/1989	Heene et al.
4,809,345	A	2/1989	Tabata et al.
4,812,684	A	3/1989	Yamagiwa et al.
4,827,401	A	5/1989	Hrustich et al.
4,833,418	A	5/1989	Quintus et al.
4,868,525	A	9/1989	Dias
4,876,534	A	10/1989	Mead et al.
4,879,461	A	11/1989	Phillipp
4,885,484	A	12/1989	Gray
4,907,121	A	3/1990	Hrassky
4,935,702	A	6/1990	Mead et al.
4,939,637	A	7/1990	Pawloski
4,942,540	A	7/1990	Black et al.
4,947,169	A	8/1990	Smith et al.
4,953,928	A	9/1990	Anderson et al.
4,962,342	A	10/1990	Mead et al.
4,964,074	A	10/1990	Suzuki et al.
4,969,087	A	11/1990	Tanagawa et al.
4,970,408	A	11/1990	Hanke et al.
4,972,372	A	11/1990	Ueno
4,977,381	A	12/1990	Main
4,980,652	A	12/1990	Tarusawa et al.
4,999,519	A	3/1991	Kitsukawa et al.
5,043,674	A	8/1991	Bonaccio et al.
5,049,758	A	9/1991	Mead et al.
5,050,168	A	9/1991	Paterson
5,053,949	A	10/1991	Allison et al.
5,055,827	A	10/1991	Phillipp
5,059,920	A	10/1991	Anderson et al.
5,068,622	A	11/1991	Mead et al.
5,073,759	A	12/1991	Mead et al.
5,083,044	A	1/1992	Mead et al.
5,087,822	A	2/1992	Fraser et al.
5,095,284	A	3/1992	Mead
5,097,305	A	3/1992	Mead et al.
5,107,146	A	4/1992	El-Ayat
5,107,149	A	4/1992	Platt et al.
5,109,261	A	4/1992	Mead et al.
5,119,038	A	6/1992	Anderson et al.
5,120,996	A	6/1992	Mead et al.
5,122,800	A	6/1992	Phillipp
5,126,685	A	6/1992	Platt et al.
5,127,103	A	6/1992	Hill et al.
5,128,871	A	7/1992	Schmitz
5,140,197	A	8/1992	Grider
5,142,247	A	8/1992	Lada et al.
5,146,106	A	9/1992	Anderson et al.
5,150,079	A	9/1992	Williams et al.
5,155,836	A	10/1992	Jordan et al.
5,159,292	A	10/1992	Canfield et al.
5,159,335	A	10/1992	Veneruso
5,160,899	A	11/1992	Anderson et al.
5,161,124	A	11/1992	Love
5,165,054	A	11/1992	Platt et al.
5,166,562	A	11/1992	Allen et al.
5,175,884	A	12/1992	Suarez
5,179,531	A	1/1993	Yamaki
5,198,817	A	3/1993	Walden et al.
5,200,751	A	4/1993	Smith
5,202,687	A	4/1993	Distinti
5,204,549	A	4/1993	Platt et al.
5,206,582	A	4/1993	Ekstedt et al.
5,220,512	A	6/1993	Watkins et al.
5,230,000	A	7/1993	Mozingo et al.
5,235,617	A	8/1993	Mallard, Jr.
5,241,492	A	8/1993	Girardeau, Jr.
5,243,554	A	9/1993	Allen et al.
5,245,262	A	9/1993	Moody et al.
5,248,843	A	9/1993	Billings
5,248,873	A	9/1993	Allen et al.
5,258,760	A	11/1993	Moody et al.
5,260,592	A	11/1993	Mead et al.
5,260,979	A	11/1993	Parker et al.
5,270,963	A	12/1993	Allen et al.
5,276,407	A	1/1994	Mead et al.
5,276,890	A	1/1994	Arai
5,280,199	A	1/1994	Itakura
5,289,023	A	2/1994	Mead
5,303,329	A	4/1994	Mead et al.
5,304,955	A	4/1994	Atriss et al.
5,305,017	A	4/1994	Gerphide
5,305,312	A	4/1994	Fornek et al.
5,307,381	A	4/1994	Ahuja
5,313,618	A	5/1994	Pawloski
5,317,202	A	5/1994	Waizman
5,319,370	A	6/1994	Signore et al.
5,319,771	A	6/1994	Takeda
5,321,828	A	6/1994	Phillips et al.
5,324,958	A	6/1994	Mead et al.
5,325,512	A	6/1994	Takahashi
5,329,471	A	7/1994	Swoboda et al.
5,331,215	A	7/1994	Allen et al.
5,331,315	A	7/1994	Crosette
5,331,571	A	7/1994	Aronoff et al.
5,334,952	A	8/1994	Maddy et al.
5,336,936	A	8/1994	Allen et al.
5,339,213	A	8/1994	O'Callaghan
5,339,262	A	8/1994	Rostoker et al.
5,345,195	A	9/1994	Cordoba et al.
5,349,303	A	9/1994	Gerpheide
5,355,097	A	10/1994	Scott et al.
5,357,626	A	10/1994	Johnson et al.
5,361,290	A	11/1994	Akiyama
5,371,504	A	12/1994	Lewis et al.
5,371,860	A	12/1994	Mura et al.
5,371,878	A	12/1994	Coker
5,374,787	A	12/1994	Miller et al.
5,378,935	A	1/1995	Korhonen et al.
5,381,515	A	1/1995	Platt et al.
5,384,467	A	1/1995	Plimon et al.
5,392,784	A	2/1995	Gudaitis
5,394,522	A	2/1995	Sanchez-Frank et al.
5,396,245	A	3/1995	Rempfer
5,398,261	A	3/1995	Marbot
5,399,922	A	3/1995	Kiani et al.
5,408,194	A	4/1995	Steinbach et al.
5,414,308	A	5/1995	Lee et al.
5,414,380	A	5/1995	Floyd et al.
5,416,895	A	5/1995	Anderson et al.
5,424,689	A	6/1995	Gillig et al.
5,426,378	A	6/1995	Ong
5,426,384	A	6/1995	May
5,428,319	A	6/1995	Marvin et al.
5,430,395	A	7/1995	Ichimaru
5,430,687	A	7/1995	Hung et al.
5,432,476	A	7/1995	Tran
5,438,672	A	8/1995	Dey
5,440,305	A	8/1995	Signore et al.
5,455,731	A	10/1995	Parkinson
5,455,927	A	10/1995	Huang
5,457,410	A	10/1995	Ting
5,457,479	A	10/1995	Cheng
5,463,591	A	10/1995	Aimoto et al.
5,479,643	A	12/1995	Bhaskar et al.
5,479,652	A	12/1995	Dreyer et al.
5,481,471	A	1/1996	Naglestad
5,488,204	A	1/1996	Mead et al.
5,493,246	A	2/1996	Anderson
5,493,723	A	2/1996	Beck et al.
5,495,077	A	2/1996	Miller et al.
5,495,593	A	2/1996	Elmer et al.
5,495,594	A	2/1996	MacKenna et al.
5,499,192	A	3/1996	Knapp et al.
5,517,198	A	5/1996	McEwan
5,519,854	A	5/1996	Watt
5,530,444	A	6/1996	Tice et al.
5,530,673	A	6/1996	Tobita et al.
5,530,813	A	6/1996	Paulsen et al.
5,541,878	A	7/1996	LeMoncheck et al.

5,543,588 A	8/1996	Bisset et al.
5,543,590 A	8/1996	Gillespie et al.
5,543,591 A	8/1996	Gillespie et al.
5,544,067 A	8/1996	Rostoker et al.
5,544,311 A	8/1996	Harenberg et al.
5,546,433 A	8/1996	Tran et al.
5,546,562 A	8/1996	Patel
5,552,725 A	9/1996	Ray et al.
5,552,748 A	9/1996	O'Shaughnessy
5,554,951 A	9/1996	Gough
5,555,452 A	9/1996	Callaway et al.
5,555,907 A	9/1996	Phillipp
5,557,762 A	9/1996	Okuaki et al.
5,559,502 A	9/1996	Schutte
5,559,996 A	9/1996	Fujioka et al.
5,563,526 A	10/1996	Hastings et al.
5,563,529 A	10/1996	Seltzer et al.
5,564,010 A	10/1996	Henry et al.
5,564,108 A	10/1996	Hunsaker et al.
5,565,658 A	10/1996	Gerpheide et al.
5,566,702 A	10/1996	Phillipp
5,572,665 A	11/1996	Nakabayashi et al.
5,572,719 A	11/1996	Biesterfeldt
5,574,678 A	11/1996	Gorecki
5,574,852 A	11/1996	Bakker et al.
5,574,892 A	11/1996	Christensen
5,579,353 A	11/1996	Parmenter et al.
5,587,957 A	12/1996	Kowalczyk et al.
5,590,354 A	12/1996	Klapproth et al.
5,594,388 A	1/1997	O'Shaughnessy et al.
5,594,734 A	1/1997	Worsley et al.
5,594,890 A	1/1997	Yamaura et al.
5,600,262 A	2/1997	Kolze
5,604,466 A	2/1997	Dreps et al.
5,608,892 A	3/1997	Wakerly
5,625,316 A	4/1997	Chambers et al.
5,629,857 A	5/1997	Brennan
5,629,891 A	5/1997	LeMoncheck et al.
5,630,052 A	5/1997	Shah
5,630,057 A	5/1997	Hait
5,630,102 A	5/1997	Johnson et al.
5,633,766 A	5/1997	Hase et al.
5,642,295 A	6/1997	Smayling
5,648,642 A	7/1997	Miller et al.
5,663,900 A	9/1997	Bhandari et al.
5,663,965 A	9/1997	Seymour
5,664,199 A	9/1997	Kuwahara
5,670,915 A	9/1997	Cooper et al.
5,673,198 A	9/1997	Lawman et al.
5,675,825 A	10/1997	Dreyer et al.
5,677,691 A	10/1997	Hosticka et al.
5,680,070 A	10/1997	Anderson et al.
5,682,032 A	10/1997	Phillipp
5,684,434 A	11/1997	Mann et al.
5,686,844 A	11/1997	Hull et al.
5,689,196 A	11/1997	Schutte
5,691,664 A	11/1997	Anderson et al.
5,691,898 A	11/1997	Rosenberg et al.
5,694,063 A	12/1997	Burilson et al.
5,696,952 A	12/1997	Pontarelli
5,699,024 A	12/1997	Manlove et al.
5,703,871 A	12/1997	Pope et al.
5,706,453 A	1/1998	Cheng et al.
5,708,798 A	1/1998	Lynch et al.
5,710,906 A	1/1998	Ghosh et al.
5,712,969 A	1/1998	Zimmermann et al.
5,724,009 A	3/1998	Collins et al.
5,727,170 A	3/1998	Mitchell et al.
5,730,165 A	3/1998	Phillipp
5,732,277 A	3/1998	Kodosky et al.
5,734,272 A	3/1998	Belot et al.
5,734,334 A	3/1998	Hsieh et al.
5,737,557 A	4/1998	Sullivan
5,737,760 A	4/1998	Grimmer et al.
5,745,011 A	4/1998	Scott
5,748,048 A	5/1998	Moyal
5,748,875 A	5/1998	Tzori
5,752,013 A	5/1998	Christensen et al.
5,754,552 A	5/1998	Allmond et al.
5,754,826 A	5/1998	Gamal et al.
5,757,368 A	5/1998	Gerpheide et al.
5,758,058 A	5/1998	Milburn
5,761,128 A	6/1998	Watanabe
5,763,909 A	6/1998	Mead et al.
5,764,714 A	6/1998	Stansell et al.
5,767,457 A	6/1998	Gerpheide et al.
5,768,560 A	6/1998	Lieberman et al.
5,774,704 A	6/1998	Williams
5,777,399 A	7/1998	Shibuya
5,781,747 A	7/1998	Kametani
5,784,545 A	7/1998	Anderson et al.
5,790,957 A	8/1998	Heidari
5,796,183 A	8/1998	Hourmand
5,802,073 A	9/1998	Platt
5,802,290 A	9/1998	Casselman
5,805,792 A	9/1998	Swoboda et al.
5,808,883 A	9/1998	Hawkes
5,812,698 A	9/1998	Platt et al.
5,818,444 A	10/1998	Alimpich et al.
5,819,028 A	10/1998	Manghirmalani et al.
5,822,387 A	10/1998	Mar
5,828,693 A	10/1998	Mays et al.
5,838,583 A	11/1998	Varadarajan et al.
5,841,078 A	11/1998	Miller et al.
5,841,996 A	11/1998	Nolan et al.
5,844,265 A	12/1998	Mead et al.
5,850,156 A	12/1998	Wittman
5,852,733 A	12/1998	Chien et al.
5,854,625 A	12/1998	Frisch et al.
5,857,109 A	1/1999	Taylor
5,859,993 A	1/1999	Snyder
5,861,583 A	1/1999	Schediwy et al.
5,861,875 A	1/1999	Gerpheide
5,864,242 A	1/1999	Allen et al.
5,864,392 A	1/1999	Winklhofer et al.
5,867,046 A	2/1999	Sugasawa
5,867,399 A	2/1999	Rostoker et al.
5,869,979 A	2/1999	Bocchino
5,870,004 A	2/1999	Lu
5,870,309 A	2/1999	Lawman
5,870,345 A	2/1999	Stecker
5,872,464 A	2/1999	Gradinariu
5,874,958 A	2/1999	Ludolph
5,875,293 A	2/1999	Bell et al.
5,877,656 A	3/1999	Mann et al.
5,878,425 A	3/1999	Redpath
5,880,411 A	3/1999	Gillespie et al.
5,880,598 A	3/1999	Duong
5,883,623 A	3/1999	Cseri
5,886,582 A	3/1999	Stansell
5,889,236 A	3/1999	Gillespie et al.
5,889,723 A	3/1999	Pascucci
5,889,988 A	3/1999	Held
5,894,226 A	4/1999	Koyama
5,894,243 A	4/1999	Hwang
5,894,565 A	4/1999	Furtek et al.
5,895,494 A	4/1999	Scalzi et al.
5,896,068 A	4/1999	Moyal
5,896,330 A	4/1999	Gibson
5,898,345 A	4/1999	Namura et al.
5,900,780 A	5/1999	Hirose et al.
5,901,062 A	5/1999	Burch et al.
5,903,718 A	5/1999	Marik
5,905,398 A	5/1999	Todsen et al.
5,911,059 A	6/1999	Profit, Jr.
5,914,465 A	6/1999	Allen et al.
5,914,633 A	6/1999	Comino et al.
5,914,708 A	6/1999	LaGrange et al.
5,920,310 A	7/1999	Faggin et al.
5,923,264 A	7/1999	Lavelle et al.
5,926,566 A	7/1999	Wang et al.
5,929,710 A	7/1999	Bien
5,930,150 A	7/1999	Cohen et al.
5,933,356 A	8/1999	Rostoker et al.
5,933,816 A	8/1999	Zeanah et al.
5,935,266 A	8/1999	Thurnhofer et al.
5,939,904 A	8/1999	Fetterman et al.
5,939,949 A	8/1999	Olgaard et al.

5,941,991	A	8/1999	Kageshima
5,942,733	A	8/1999	Allen et al.
5,943,052	A	8/1999	Allen et al.
5,945,878	A	8/1999	Westwick et al.
5,949,632	A	9/1999	Barreras, Sr. et al.
5,952,888	A	9/1999	Scott
5,959,871	A	9/1999	Pierzchala et al.
5,963,075	A	10/1999	Hiiragizawa
5,963,105	A	10/1999	Nguyen
5,963,503	A	10/1999	Lee
5,964,893	A	10/1999	Circello et al.
5,966,532	A	10/1999	McDonald et al.
5,968,135	A	10/1999	Teramoto et al.
5,968,178	A	10/1999	Williams et al.
5,969,513	A	10/1999	Clark
5,969,632	A	10/1999	Diamant et al.
5,973,368	A	10/1999	Pearce et al.
5,978,584	A	11/1999	Nishibata et al.
5,978,937	A	11/1999	Miyamori et al.
5,982,105	A	11/1999	Masters
5,982,229	A	11/1999	Wong et al.
5,982,241	A	11/1999	Nguyen et al.
5,983,277	A	11/1999	Heile et al.
5,986,479	A	11/1999	Mohan
5,987,246	A	11/1999	Thomsen et al.
5,988,902	A	11/1999	Holehan
5,994,939	A	11/1999	Johnson et al.
5,996,032	A	11/1999	Baker
5,999,725	A	12/1999	Barbier et al.
6,002,398	A	12/1999	Wilson
6,003,054	A	12/1999	Oshima et al.
6,003,133	A	12/1999	Moughanni et al.
6,005,814	A	12/1999	Mulholland et al.
6,005,904	A	12/1999	Knapp et al.
6,008,685	A	12/1999	Kunst
6,008,703	A	12/1999	Perrott et al.
6,009,270	A	12/1999	Mann
6,009,496	A	12/1999	Tsai
6,011,407	A	1/2000	New
6,012,835	A	1/2000	Thompson et al.
6,014,135	A	1/2000	Fernandes
6,014,509	A	1/2000	Furtek et al.
6,016,554	A	1/2000	Skrovan et al.
6,016,563	A	1/2000	Fleisher
6,018,559	A	1/2000	Azegami et al.
6,023,422	A	2/2000	Allen et al.
6,023,565	A	2/2000	Lawman et al.
6,026,134	A	2/2000	Duffy et al.
6,026,501	A	2/2000	Hohl et al.
6,028,271	A	2/2000	Gillespie et al.
6,028,959	A	2/2000	Wang et al.
6,031,365	A	2/2000	Sharpe-Geisler
6,032,268	A	2/2000	Swoboda et al.
6,034,538	A	3/2000	Abramovici
6,037,807	A	3/2000	Wu et al.
6,038,551	A	3/2000	Barlow et al.
6,041,406	A	3/2000	Mann
6,043,695	A	3/2000	O'Sullivan
6,043,719	A	3/2000	Lin et al.
6,051,772	A	4/2000	Cameron et al.
6,052,035	A	4/2000	Nolan et al.
6,052,524	A	4/2000	Pauna
6,057,705	A	5/2000	Wojewoda et al.
6,058,263	A	5/2000	Voth
6,061,511	A	5/2000	Martantz et al.
6,066,961	A	5/2000	Lee et al.
6,070,003	A	5/2000	Gove et al.
6,072,803	A	6/2000	Allmond et al.
6,075,941	A	6/2000	Itoh et al.
6,079,985	A	6/2000	Wohl et al.
6,081,140	A	6/2000	King
6,094,730	A	7/2000	Lopez et al.
6,097,432	A	8/2000	Mead et al.
6,101,457	A	8/2000	Barch et al.
6,101,617	A	8/2000	Burckhartt et al.
6,104,217	A	8/2000	Magana
6,104,325	A	8/2000	Liaw et al.
6,107,769	A	8/2000	Saylor et al.
6,107,826	A	8/2000	Young et al.
6,107,882	A	8/2000	Gabara et al.
6,110,223	A	8/2000	Southgate et al.
6,111,431	A	8/2000	Estrada
6,112,264	A	8/2000	Beasley et al.
6,121,791	A	9/2000	Abbott
6,121,805	A	9/2000	Thamsirianunt et al.
6,121,965	A	9/2000	Kenney et al.
6,125,416	A	9/2000	Warren
6,130,548	A	10/2000	Koifman
6,130,551	A	10/2000	Agrawal et al.
6,133,773	A	10/2000	Garlepp et al.
6,134,516	A	10/2000	Wang et al.
6,141,376	A	10/2000	Shaw
6,141,764	A	10/2000	Ezell
6,144,327	A	11/2000	Distinti et al.
6,148,104	A	11/2000	Wang et al.
6,148,441	A	11/2000	Woodward
6,149,299	A	11/2000	Aslan et al.
6,150,866	A	11/2000	Eto et al.
6,154,064	A	11/2000	Proebsting
6,157,024	A	12/2000	Chapdelaine et al.
6,157,270	A	12/2000	Tso
6,161,199	A	12/2000	Szeto et al.
6,166,367	A	12/2000	Cho
6,166,960	A	12/2000	Marneweck et al.
6,167,077	A	12/2000	Ducaroir
6,167,559	A	12/2000	Furtek et al.
6,169,383	B1	1/2001	Johnson
6,172,571	B1	1/2001	Moyal et al.
6,173,419	B1	1/2001	Barnett
6,175,914	B1	1/2001	Mann
6,175,949	B1	1/2001	Gristede et al.
6,183,131	B1	2/2001	Holloway et al.
6,185,127	B1	2/2001	Myers et al.
6,185,450	B1	2/2001	Seguine et al.
6,185,522	B1	2/2001	Bakker
6,185,703	B1	2/2001	Guddat et al.
6,185,732	B1	2/2001	Mann et al.
6,188,228	B1	2/2001	Philipp
6,188,241	B1	2/2001	Gauthier et al.
6,188,381	B1	2/2001	van der Wal et al.
6,188,391	B1	2/2001	Seely et al.
6,188,975	B1	2/2001	Gay
6,191,603	B1	2/2001	Muradali et al.
6,191,660	B1	2/2001	Mar et al.
6,192,431	B1	2/2001	Dabral et al.
6,201,829	B1	3/2001	Schneider
6,202,044	B1	3/2001	Tzori
6,204,687	B1	3/2001	Schultz et al.
6,205,574	B1	3/2001	Dellinger et al.
6,208,572	B1	3/2001	Adams et al.
6,211,708	B1	4/2001	Kemmer
6,211,715	B1	4/2001	Terauchi
6,211,741	B1	4/2001	Dalmia
6,215,352	B1	4/2001	Sudo
6,219,729	B1	4/2001	Keats et al.
6,222,528	B1	4/2001	Gerpheide et al.
6,223,144	B1	4/2001	Barnett et al.
6,223,147	B1	4/2001	Bowers
6,223,272	B1	4/2001	Coehlo et al.
RE37,195	E	5/2001	Kean
6,225,866	B1	5/2001	Kubota et al.
6,236,242	B1	5/2001	Hedberg
6,236,275	B1	5/2001	Dent
6,236,278	B1	5/2001	Olgaard
6,236,593	B1	5/2001	Hong et al.
6,239,389	B1	5/2001	Allen et al.
6,239,798	B1	5/2001	Ludolph et al.
6,240,375	B1	5/2001	Sonoda
6,246,258	B1	6/2001	Lesea
6,246,410	B1	6/2001	Bergeron et al.
6,249,167	B1	6/2001	Oguchi et al.
6,249,447	B1	6/2001	Boylan et al.
6,253,754	B1	7/2001	Ward
6,262,717	B1	7/2001	Donohue et al.
6,263,302	B1	7/2001	Hellestrand et al.
6,263,339	B1	7/2001	Hirsh
6,263,484	B1	7/2001	Yang
6,275,117	B1	8/2001	Abugharbieh et al.

6,278,568	B1	8/2001	Cloke et al.
6,280,391	B1	8/2001	Olson et al.
6,281,753	B1	8/2001	Corsi et al.
6,282,547	B1	8/2001	Hirsh
6,282,551	B1	8/2001	Anderson et al.
6,286,127	B1	9/2001	King et al.
6,288,707	B1	9/2001	Philipp
6,289,300	B1	9/2001	Brannick et al.
6,289,489	B1	9/2001	Bold et al.
6,292,028	B1	9/2001	Tomita
6,294,932	B1	9/2001	Watarai
6,294,962	B1	9/2001	Mar
6,298,320	B1	10/2001	Buckmaster et al.
6,304,014	B1	10/2001	England et al.
6,304,101	B1	10/2001	Nishihara
6,304,790	B1	10/2001	Nakamura et al.
6,307,413	B1	10/2001	Dalmia et al.
6,310,521	B1	10/2001	Dalmia
6,310,611	B1	10/2001	Caldwell
6,311,149	B1	10/2001	Ryan et al.
6,314,530	B1	11/2001	Mann
6,320,184	B1	11/2001	Winklhofer et al.
6,320,282	B1	11/2001	Caldwell
6,321,369	B1	11/2001	Heile et al.
6,323,846	B1	11/2001	Westerman et al.
6,324,628	B1	11/2001	Chan
6,326,859	B1	12/2001	Goldman et al.
6,332,201	B1	12/2001	Chin et al.
6,337,579	B1	1/2002	Mochida
6,338,109	B1	1/2002	Snyder et al.
6,339,815	B1	1/2002	Feng et al.
6,342,907	B1	1/2002	Petty et al.
6,345,383	B1	2/2002	Ueki
6,347,395	B1	2/2002	Payne et al.
6,351,789	B1	2/2002	Green
6,353,452	B1	3/2002	Hamada et al.
6,355,980	B1	3/2002	Callahan
6,356,862	B2	3/2002	Bailey
6,356,958	B1	3/2002	Lin
6,356,960	B1	3/2002	Jones et al.
6,359,950	B2	3/2002	Gossmann et al.
6,362,697	B1	3/2002	Pulvirenti
6,366,174	B1	4/2002	Berry et al.
6,366,300	B1	4/2002	Ohara et al.
6,366,874	B1	4/2002	Lee et al.
6,366,878	B1	4/2002	Grunert
6,370,635	B2	4/2002	Snyder
6,371,878	B1	4/2002	Bowen
6,373,954	B1	4/2002	Malcolm et al.
6,374,370	B1	4/2002	Bockhaus et al.
6,377,009	B1	4/2002	Philipp
6,377,575	B1	4/2002	Mullaney et al.
6,377,646	B1	4/2002	Sha
6,380,811	B1	4/2002	Zarubinsky et al.
6,380,929	B1	4/2002	Platt
6,380,931	B1	4/2002	Gillepsie et al.
6,384,947	B1	5/2002	Ackerman et al.
6,385,742	B1	5/2002	Kirsh et al.
6,388,109	B1	5/2002	Shwarz et al.
6,396,302	B2	5/2002	New et al.
6,396,357	B1	5/2002	Sun et al.
6,397,232	B1	5/2002	Cheng-Hung et al.
6,404,204	B1	6/2002	Farruggia et al.
6,404,445	B1	6/2002	Galea et al.
6,407,953	B1	6/2002	Cleeves
6,408,432	B1	6/2002	Herrmann et al.
6,411,665	B1	6/2002	Chan et al.
6,411,974	B1	6/2002	Graham et al.
6,414,671	B1	7/2002	Gillepsie et al.
6,421,698	B1	7/2002	Hong
6,425,109	B1	7/2002	Choukalos et al.
6,429,882	B1	8/2002	Abdelnur et al.
6,430,305	B1	8/2002	Decker
6,433,645	B1	8/2002	Mann et al.
6,437,805	B1	8/2002	Sojoodi et al.
6,438,565	B1	8/2002	Ammirato et al.
6,438,735	B1	8/2002	McElvain et al.
6,438,738	B1	8/2002	Elayda
6,441,073	B1	8/2002	Tanaka et al.
6,449,628	B1	9/2002	Wasson
6,449,755	B1	9/2002	Beausang et al.
6,452,437	B1	9/2002	Takeuchi et al.
6,452,514	B1	9/2002	Philipp
6,453,175	B2	9/2002	Mizell et al.
6,453,461	B1	9/2002	Chaiken
6,456,304	B1	9/2002	Angiulo et al.
6,457,355	B1	10/2002	Philipp
6,457,479	B1	10/2002	Zhuang et al.
6,460,172	B1	10/2002	Insenser Farre et al.
6,463,488	B1	10/2002	San Juan
6,466,036	B1	10/2002	Philipp
6,466,078	B1	10/2002	Stiff
6,466,898	B1	10/2002	Chan
6,473,069	B1	10/2002	Gerpheide
6,477,691	B1	11/2002	Bergamashi/Rab et al.
6,480,921	B1	11/2002	Mansoorian et al.
6,483,343	B1	11/2002	Faith et al.
6,487,700	B1	11/2002	Fukushima
6,489,899	B1	12/2002	Ely et al.
6,490,213	B1	12/2002	Mu et al.
6,492,834	B1	12/2002	Lytle et al.
6,498,720	B2	12/2002	Glad
6,499,134	B1	12/2002	Buffet et al.
6,499,359	B1	12/2002	Washeleski et al.
6,504,403	B2	1/2003	Bangs et al.
6,507,214	B1	1/2003	Snyder
6,507,215	B1	1/2003	Piasecki et al.
6,507,857	B1	1/2003	Yalcinalp
6,509,758	B2	1/2003	Piasecki et al.
6,516,428	B2	2/2003	Wenzel et al.
6,522,128	B1	2/2003	Ely et al.
6,523,416	B2	2/2003	Takagi et al.
6,525,593	B1	2/2003	Mar
6,529,791	B1	3/2003	Takagi
6,530,065	B1	3/2003	McDonald et al.
6,534,970	B1	3/2003	Ely et al.
6,535,200	B2	3/2003	Philipp
6,535,946	B1	3/2003	Bryant et al.
6,536,028	B1	3/2003	Katsioulas et al.
6,539,534	B1	3/2003	Bennett
6,542,025	B1	4/2003	Kutz et al.
6,542,844	B1	4/2003	Hanna
6,554,469	B1	4/2003	Thomson et al.
6,557,164	B1	4/2003	Faustini
6,559,685	B2	5/2003	Green
6,560,306	B1	5/2003	Duffy et al.
6,560,699	B1	5/2003	Konkle
6,563,391	B1	5/2003	Mar
6,564,179	B1	5/2003	Belhaj
6,566,961	B2	5/2003	Dasgupta et al.
6,567,426	B1	5/2003	van Hook et al.
6,567,932	B2	5/2003	Edwards et al.
6,570,557	B1	5/2003	Westerman et al.
6,571,331	B2	5/2003	Henry et al.
6,573,753	B1	6/2003	Snyder
6,574,590	B1	6/2003	Kershaw et al.
6,574,739	B1	6/2003	Kung et al.
6,575,373	B1	6/2003	Nakano
6,577,258	B2	6/2003	Ruha et al.
6,578,174	B2	6/2003	Zizzo
6,580,329	B2	6/2003	Sander
6,581,191	B1	6/2003	Schubert et al.
6,587,093	B1	7/2003	Shaw et al.
6,587,995	B1	7/2003	Duboc et al.
6,588,004	B1	7/2003	Southgate et al.
6,590,422	B1	7/2003	Dillon
6,590,517	B1	7/2003	Swanson
6,591,369	B1	7/2003	Edwards et al.
6,592,626	B1	7/2003	Bauchot et al.
6,594,796	B1	7/2003	Chiang et al.
6,594,799	B1	7/2003	Robertson et al.
6,597,212	B1	7/2003	Wang et al.
6,597,824	B2	7/2003	Newberg et al.
6,598,178	B1	7/2003	Yee et al.
6,600,346	B1	7/2003	Macaluso
6,600,351	B2	7/2003	Bisanti et al.
6,600,575	B1	7/2003	Kohara
6,601,189	B1	7/2003	Edwards et al.

6,601,236	B1	7/2003	Curtis	
6,603,330	B1	8/2003	Snyder	
6,603,348	B1	8/2003	Preuss et al.	
6,604,179	B2	8/2003	Volk et al.	
6,606,731	B1	8/2003	Baum et al.	
6,608,472	B1	8/2003	Kutz et al.	
6,610,936	B2	8/2003	Gillespie et al.	
6,611,220	B1	8/2003	Snyder	
6,611,276	B1	8/2003	Muratori et al.	
6,611,856	B1	8/2003	Liao et al.	
6,611,952	B1	8/2003	Prakash et al.	
6,613,098	B1	9/2003	Sorge et al.	
6,614,260	B1	9/2003	Welch et al.	
6,614,320	B1	9/2003	Sullam et al.	
6,614,374	B1	9/2003	Gustavsson et al.	
6,614,458	B1	9/2003	Lambert et al.	
6,617,888	B2	9/2003	Volk	
6,618,854	B1	9/2003	Mann	
6,621,356	B2	9/2003	Gotz et al.	
6,624,640	B2	9/2003	Lund et al.	
6,625,765	B1	9/2003	Krishnan	
6,628,163	B2	9/2003	Dathe et al.	
6,631,508	B1	10/2003	Williams	
6,634,008	B1	10/2003	Dole	
6,636,096	B2	10/2003	Schaffer et al.	
6,637,015	B1	10/2003	Ogami et al.	
6,639,586	B2	10/2003	Gerpheide	
6,642,857	B1	11/2003	Schediwy et al.	
6,643,151	B1	11/2003	Nebrigic et al.	
6,643,810	B2	11/2003	Whetsel	
6,649,924	B1	11/2003	Philipp et al.	
6,650,581	B2	11/2003	Hong et al.	
6,658,633	B2	12/2003	Devins et al.	
6,661,288	B2	12/2003	Morgan et al.	
6,664,978	B1	12/2003	Kekic et al.	
6,664,991	B1	12/2003	Chew et al.	
6,667,740	B2	12/2003	Ely et al.	
6,670,852	B1	12/2003	Hauck	
6,673,308	B2	1/2004	Hino et al.	
6,677,814	B2	1/2004	Low et al.	
6,677,932	B1	1/2004	Westerman	
6,678,645	B1	1/2004	Rajsuman et al.	
6,678,877	B1	1/2004	Perry et al.	
6,680,632	B1	1/2004	Meyers et al.	
6,680,731	B2	1/2004	Gerpheide et al.	
6,681,280	B1	1/2004	Miyake et al.	
6,681,359	B1	1/2004	Au et al.	
6,683,462	B2 *	1/2004	Shimizu	324/658
6,683,930	B1	1/2004	Dalmia	
6,686,787	B2	2/2004	Ling	
6,690,224	B1	2/2004	Moore	
6,691,301	B2	2/2004	Bowen	
6,697,754	B1	2/2004	Alexander	
6,701,340	B1	3/2004	Gorecki	
6,701,487	B1	3/2004	Ogami et al.	
6,701,508	B1	3/2004	Bartz et al.	
6,704,381	B1	3/2004	Moyal et al.	
6,704,879	B1	3/2004	Parrish	
6,704,889	B2	3/2004	Veenstra et al.	
6,704,893	B1	3/2004	Bauwens et al.	
6,705,511	B1	3/2004	Dames et al.	
6,711,226	B1	3/2004	Williams et al.	
6,711,731	B2	3/2004	Weiss	
6,713,897	B2	3/2004	Caldwell	
6,714,066	B2	3/2004	Gorecki et al.	
6,714,817	B2	3/2004	Daynes et al.	
6,715,132	B1	3/2004	Bartz et al.	
6,717,474	B2	4/2004	Chen et al.	
6,718,294	B1	4/2004	Bortfeld	
6,718,520	B1	4/2004	Merryman et al.	
6,718,533	B1	4/2004	Schneider et al.	
6,724,220	B1	4/2004	Snyder et al.	
6,728,900	B1	4/2004	Meli	
6,728,902	B2	4/2004	Kaiser et al.	
6,730,863	B1	5/2004	Gerpheide	
6,731,552	B2	5/2004	Perner	
6,732,068	B2	5/2004	Sample et al.	
6,732,347	B1	5/2004	Camilleri et al.	
6,738,858	B1	5/2004	Fernald et al.	
6,744,323	B1	6/2004	Moyal et al.	
6,748,569	B1	6/2004	Brooke et al.	
6,750,852	B2	6/2004	Gillespie	
6,750,889	B1	6/2004	Livingston et al.	
6,754,765	B1	6/2004	Chang et al.	
6,754,849	B2	6/2004	Tamura	
6,757,882	B2	6/2004	Chen et al.	
6,765,407	B1	7/2004	Snyder	
6,768,337	B2	7/2004	Kohno et al.	
6,768,352	B1	7/2004	Maher et al.	
6,769,622	B1	8/2004	Tournemille et al.	
6,771,552	B2	8/2004	Fujisawa	
6,774,644	B2	8/2004	Eberlein	
6,781,456	B2	8/2004	Pradhan	
6,782,068	B1	8/2004	Wilson et al.	
6,785,881	B1	8/2004	Bartz et al.	
6,788,116	B1	9/2004	Cook et al.	
6,788,221	B1	9/2004	Ely et al.	
6,788,521	B2	9/2004	Nishi	
6,791,377	B2	9/2004	Ilchmann et al.	
6,792,584	B1	9/2004	Eneboe et al.	
6,798,218	B2	9/2004	Kasperkovitz	
6,798,299	B1	9/2004	Mar et al.	
6,806,771	B1	10/2004	Hilderbrant et al.	
6,806,782	B2	10/2004	Motoyoshi et al.	
6,809,275	B1	10/2004	Cheng et al.	
6,809,566	B1	10/2004	Xin-LeBlanc	
6,810,442	B1	10/2004	Lin et al.	
6,815,979	B2	11/2004	Ooshita	
6,816,544	B1	11/2004	Bailey et al.	
6,819,142	B2	11/2004	Viehmann et al.	
6,823,282	B1	11/2004	Snyder	
6,823,497	B2	11/2004	Schubert et al.	
6,825,689	B1	11/2004	Snyder	
6,825,869	B2	11/2004	Bang	
6,829,727	B1	12/2004	Pawloski	
6,836,169	B2	12/2004	Richmond et al.	
6,839,774	B1	1/2005	Ahn et al.	
6,842,710	B1	1/2005	Gehring et al.	
6,847,203	B1	1/2005	Conti et al.	
6,850,117	B2	2/2005	Weber et al.	
6,853,598	B2	2/2005	Chevallier	
6,854,067	B1	2/2005	Kutz et al.	
6,856,433	B2	2/2005	Hatano et al.	
6,859,884	B1	2/2005	Sullam	
6,862,240	B2	3/2005	Burgan	
6,865,429	B1	3/2005	Schneider et al.	
6,865,504	B2	3/2005	Larson et al.	
6,868,500	B1	3/2005	Kutz et al.	
6,871,253	B2	3/2005	Greeff et al.	
6,871,331	B1	3/2005	Bloom et al.	
6,873,203	B1	3/2005	Latham, II et al.	
6,873,210	B2	3/2005	Mulder et al.	
6,888,453	B2	5/2005	Lutz et al.	
6,888,538	B2	5/2005	Ely et al.	
6,892,310	B1	5/2005	Kutz et al.	
6,892,315	B1	5/2005	Williams	
6,892,322	B1	5/2005	Snyder	
6,893,724	B2	5/2005	Lin et al.	
6,894,928	B2	5/2005	Owen	
6,897,390	B2	5/2005	Caldwell et al.	
6,898,101	B1	5/2005	Mann	
6,898,703	B1	5/2005	Ogami et al.	
6,900,663	B1	5/2005	Roper et al.	
6,901,563	B1	5/2005	Ogami et al.	
6,903,402	B2	6/2005	Miyazawa	
6,903,613	B1	6/2005	Mitchell et al.	
6,904,570	B2	6/2005	Foote et al.	
6,910,126	B1	6/2005	Mar et al.	
6,911,857	B1	6/2005	Stiff	
6,917,661	B1	7/2005	Scott et al.	
6,922,821	B1	7/2005	Nemecek	
6,924,668	B2	8/2005	Muller et al.	
6,934,674	B1	8/2005	Douezy et al.	
6,937,075	B2	8/2005	Lim et al.	
6,940,356	B2	9/2005	McDonald et al.	
6,941,336	B1	9/2005	Mar	
6,944,018	B2	9/2005	Caldwell	
6,949,811	B2	9/2005	Miyazawa	

6,949,984	B2	9/2005	Siniscalchi	7,221,187	B1	5/2007	Snyder et al.
6,950,954	B1	9/2005	Sullam et al.	7,227,389	B2	6/2007	Gong et al.
6,950,990	B2	9/2005	Rajarajan et al.	7,236,921	B1	6/2007	Nemecek et al.
6,952,778	B1	10/2005	Snyder	7,250,825	B2	7/2007	Wilson et al.
6,954,511	B2	10/2005	Tachimori	7,256,588	B2	8/2007	Howard et al.
6,956,419	B1	10/2005	Mann et al.	7,265,633	B1	9/2007	Stiff
6,957,180	B1	10/2005	Nemecek	7,266,768	B2	9/2007	Ferlitsch et al.
6,957,242	B1	10/2005	Snyder	7,281,846	B2	10/2007	McLeod
6,963,233	B2	11/2005	Puccio et al.	7,282,905	B2	10/2007	Chen et al.
6,967,511	B1	11/2005	Sullam	7,288,977	B2	10/2007	Stanley
6,967,960	B1	11/2005	Bross et al.	7,298,124	B2	11/2007	Kan et al.
6,968,346	B2	11/2005	Hekmatpour	7,301,835	B2	11/2007	Joshi et al.
6,969,978	B2	11/2005	Dening	7,307,485	B1	12/2007	Snyder et al.
6,970,844	B1	11/2005	Bierenbaum	7,312,616	B2	12/2007	Snyder
6,973,400	B2	12/2005	Cahill-O'Brien et al.	7,323,879	B2	1/2008	Kuo et al.
6,975,123	B1	12/2005	Malang et al.	7,342,405	B2	3/2008	Eldridge et al.
6,980,060	B2	12/2005	Boerstler et al.	7,358,714	B2	4/2008	Watanabe et al.
6,981,090	B1	12/2005	Kutz et al.	7,376,001	B2	5/2008	Joshi et al.
6,988,192	B2	1/2006	Snider	7,376,904	B2	5/2008	Cifra et al.
6,996,799	B1	2/2006	Cismas et al.	7,386,740	B2	6/2008	Kutz et al.
7,005,933	B1	2/2006	Shutt	7,400,183	B1	7/2008	Sivadasan et al.
7,009,444	B1	3/2006	Scott	7,421,251	B2	9/2008	Westwick et al.
7,015,735	B2	3/2006	Kimura et al.	7,466,307	B2	12/2008	Trent, Jr. et al.
7,017,145	B2	3/2006	Taylor	7,542,533	B2	6/2009	Jasa et al.
7,017,409	B2	3/2006	Zielinski et al.	7,554,847	B2	6/2009	Lee
7,023,215	B2	4/2006	Seenwyk	2001/0002129	A1	5/2001	Zimmerman et al.
7,023,257	B1	4/2006	Sullam	2001/0010083	A1	7/2001	Satoh
7,024,636	B2	4/2006	Weed	2001/0038392	A1	11/2001	Humpleman et al.
7,024,654	B2	4/2006	Bersch et al.	2001/0043081	A1	11/2001	Rees
7,026,861	B2	4/2006	Seenwyk	2001/0044927	A1	11/2001	Kamiewicz
7,030,513	B2	4/2006	Caldwell	2001/0045861	A1	11/2001	Bloodworth et al.
7,030,656	B2	4/2006	Lo et al.	2001/0047509	A1	11/2001	Mason et al.
7,030,688	B2	4/2006	Dosho et al.	2002/0010716	A1	1/2002	McCartney et al.
7,030,782	B2	4/2006	Ely et al.	2002/0016706	A1	2/2002	Cooke et al.
7,034,603	B2	4/2006	Brady et al.	2002/0023110	A1	2/2002	Fortin et al.
7,042,301	B2	5/2006	Sutardja	2002/0035701	A1	3/2002	Casebolt et al.
7,055,035	B2	5/2006	Allison et al.	2002/0042696	A1	4/2002	Garcia et al.
7,058,921	B1	6/2006	Hwang et al.	2002/0052729	A1	5/2002	Kyung et al.
7,073,158	B2	7/2006	McCubbrey	2002/0059543	A1	5/2002	Cheng et al.
7,076,420	B1	7/2006	Snyder et al.	2002/0063688	A1	5/2002	Shaw et al.
7,086,014	B1	8/2006	Bartz et al.	2002/0065646	A1	5/2002	Waldie et al.
7,088,166	B1	8/2006	Reinschmidt et al.	2002/0068989	A1	6/2002	Ebisawa et al.
7,089,175	B1	8/2006	Nemecek et al.	2002/0073119	A1	6/2002	Richard
7,091,713	B2	8/2006	Erdelyi et al.	2002/0073380	A1	6/2002	Cooke
7,092,980	B1	8/2006	Mar et al.	2002/0080186	A1	6/2002	Frederiksen
7,098,414	B2	8/2006	Caldwell	2002/0085020	A1	7/2002	Carroll, Jr.
7,099,818	B1	8/2006	Nemecek	2002/0109722	A1	8/2002	Rogers et al.
7,109,978	B2	9/2006	Gillespie et al.	2002/0116168	A1	8/2002	Kim
7,117,485	B2	10/2006	Wilkinson et al.	2002/0121679	A1	9/2002	Bazarjani et al.
7,119,550	B2	10/2006	Kitano	2002/0122060	A1	9/2002	Markel
7,119,602	B2	10/2006	Davis	2002/0129334	A1	9/2002	Dane et al.
7,124,376	B2	10/2006	Zaidi et al.	2002/0133771	A1	9/2002	Barnett
7,127,630	B1	10/2006	Snyder	2002/0133794	A1	9/2002	Kanapathippillai et al.
7,129,793	B2	10/2006	Gramegna	2002/0138516	A1	9/2002	Igra
7,129,873	B2	10/2006	Kawamura	2002/0145433	A1	10/2002	Morrise et al.
7,132,835	B1	11/2006	Arcus	2002/0152234	A1	10/2002	Estrada et al.
7,133,140	B2	11/2006	Lukacs et al.	2002/0152449	A1	10/2002	Lin
7,133,793	B2	11/2006	Ely et al.	2002/0156885	A1	10/2002	Thakkar
7,138,868	B2	11/2006	Sanchez et al.	2002/0156998	A1	10/2002	Casselman
7,139,530	B2	11/2006	Kusbel	2002/0161802	A1	10/2002	Gabrick et al.
7,141,968	B2	11/2006	Hibbs et al.	2002/0166100	A1	11/2002	Meding
7,141,987	B2	11/2006	Hibbs et al.	2002/0174134	A1	11/2002	Goykhman
7,149,316	B1	12/2006	Kutz et al.	2002/0174411	A1	11/2002	Feng et al.
7,150,002	B1	12/2006	Anderson et al.	2002/0191029	A1	12/2002	Gillespie et al.
7,151,528	B2	12/2006	Taylor et al.	2003/0011639	A1	1/2003	Webb
7,154,294	B2	12/2006	Liu et al.	2003/0014447	A1	1/2003	White
7,161,936	B1	1/2007	Barrass et al.	2003/0025734	A1	2/2003	Boose et al.
7,162,410	B1	1/2007	Nemecek et al.	2003/0041235	A1	2/2003	Meyer
7,171,455	B1	1/2007	Gupta et al.	2003/0056071	A1	3/2003	Triece et al.
7,176,701	B2	2/2007	Wachi et al.	2003/0058469	A1	3/2003	Buis et al.
7,180,342	B1	2/2007	Shutt et al.	2003/0061572	A1	3/2003	McClannahan et al.
7,185,162	B1	2/2007	Snyder	2003/0062889	A1	4/2003	Ely et al.
7,185,321	B1	2/2007	Roe et al.	2003/0080755	A1	5/2003	Kobayashi
7,188,063	B1	3/2007	Snyder	2003/0126947	A1	7/2003	Moore et al.
7,193,901	B2	3/2007	Ruby et al.	2003/0135842	A1	7/2003	Frey et al.
7,199,783	B2 *	4/2007	Wenstrand et al. 345/156	2003/0149961	A1	8/2003	Kawai et al.
7,200,507	B2	4/2007	Chen et al.	2003/0229482	A1	12/2003	Cook et al.
7,206,733	B1	4/2007	Nemecek	2004/0054821	A1	3/2004	Warren et al.
7,212,189	B2	5/2007	Shaw et al	2004/0153802	A1	8/2004	Kudo et al.

2004/0205553	A1	10/2004	Hall et al.	
2004/0205617	A1	10/2004	Light	
2004/0205695	A1	10/2004	Fletcher	
2005/0024341	A1	2/2005	Gillespie et al.	
2005/0143968	A9	6/2005	Odom et al.	
2005/0240917	A1	10/2005	Wu	
2005/0248534	A1 *	11/2005	Kehlstadt	345/163
2005/0280453	A1	12/2005	Hsieh	
2006/0032680	A1	2/2006	Elias et al.	
2006/0097991	A1	5/2006	Hotelling et al.	
2006/0273804	A1	12/2006	Delorme et al.	
2008/0095213	A1	4/2008	Lin et al.	
2008/0259998	A1	10/2008	Venkataraman et al.	

FOREIGN PATENT DOCUMENTS

EP	0308583	A2	3/1989
EP	368398	A1	5/1990
EP	0450863	A2	10/1991
EP	0499383	A2	8/1992
EP	0639816	A2	2/1995
EP	1170671A1	A1	1/2002
EP	1205848	A1	5/2002
EP	1191423A2	A1	2/2003
JP	404083405	A1	3/1992
JP	405055842	A1	3/1993
JP	06021732	A1	1/1994
JP	404095408	A1	3/2002
WO	9532478	A1	11/1995
WO	PCT/US96/17305	A1	6/1996
WO	PCT/US98/34376	A1	8/1998
WO	PCT/US99/09712	A1	2/1999

OTHER PUBLICATIONS

USPTO Non-Final Rejection for U.S. Appl. No. 10/238,966 dated Jun. 30, 2008; 12 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/238,966 dated Dec. 26, 2007; 12 pages.
USPTO Final Rejection for U.S. Appl. No. 10/238,966 dated Sep. 27, 2007; 9 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/238,966 dated Apr. 19, 2007; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/238,966 dated Oct. 20, 2006; 8 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/238,966 dated Apr. 6, 2006; 8 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/033,027 dated Mar. 31, 2009; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/033,027 dated Dec. 18, 2008; 5 pages.
USPTO Final Rejection for U.S. Appl. No. 10/033,027 dated Jun. 8, 2007; 8 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/033,027 dated Dec. 21, 2006; 31 pages.
USPTO Final Rejection for U.S. Appl. No. 10/033,027 dated Aug. 9, 2006; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/033,027 dated Apr. 26, 2006; 26 pages.
USPTO Final Rejection for U.S. Appl. No. 10/033,027 dated Oct. 31, 2005; 24 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/033,027 dated Apr. 20, 2005; 20 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/033,027 dated Oct. 18, 2004; 17 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/001,478 dated Oct. 20, 2008; 18 pages.
USPTO Final Rejection for U.S. Appl. No. 10/001,478 dated Jun. 4, 2008; 18 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/001,476 dated Jan. 30, 2008; 19 pages.
USPTO Final Rejection for U.S. Appl. No. 10/001,478 dated Sep. 17, 2007; 15 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/001,478 dated Apr. 2, 2007; 17 pages.
USPTO Final Rejection for U.S. Appl. No. 10/001,478 dated Sep. 5, 2006; 19 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/001,478 dated Mar. 15, 2006; 19 pages.
USPTO Final Rejection for U.S. Appl. No. 10/001,478 dated Oct. 24, 2005; 15 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/001,478 dated May 16, 2005; 13 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/002,217 dated Jan. 28, 2009; 4 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/002,217 dated Oct. 14, 2008; 6 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/002,217 dated Jun. 6, 2008; 7 pages.
USPTO Final Rejection for U.S. Appl. No. 10/002,217 dated Feb. 6, 2008; 10 pages.
USPTO Non-Final Rejection for 10/002,217 dated Aug. 3, 2007; 10 pages.
USPTO Final Rejection for 10/002,217 dated Mar. 7, 2007; 12 pages.
USPTO Non-Final Rejection for 10/002,217 dated Oct. 2, 2006; 21 pages.
USPTO Non-Final Rejection for 10/002,217 dated Apr. 3, 2006; 12 pages.
USPTO Final Rejection for U.S. Appl. No. 10/002,217 dated Nov. 17, 2005; 17 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/002,217 dated May 19, 2005; 15 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/001,477 dated Nov. 10, 2008; 7 pages.
USPTO Advisory Action for U.S. Appl. No. 10/001,477 dated Oct. 10, 2008; 3 pages.
USPTO Final Rejection for U.S. Appl. No. 10/001,477 dated Jun. 30, 2008; 15 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/001,477 dated Dec. 6, 2007; 13 pages.
USPTO Final Rejection for U.S. Appl. No. 10/001,477 dated Jul. 23, 2007; 16 pages.
USPTO Non-Final Rejection for 10/001,477 dated Jan. 22, 2007; 15 pages.
USPTO Final Rejection for 10/001,477 dated Aug. 24, 2006; 13 pages.
USPTO Non-Final Rejection for 10/001,477 dated Mar. 2, 2006; 14 pages.
USPTO Final Rejection for U.S. Appl. No. 10/001,477 dated Oct. 24, 2005; 13 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/001,477 dated May 11, 2005; 10 pages.
"Micropower CMOS Temperature Sensor with Digital Output;" Bakker et al., IEEE Journal of Solid-State Circuits, 1996; 3 pages.
"WP 3.5: An Integrated Time Reference;" Blauschild, Digest of Technical Papers, 1994; 4 pages.
"An Analog PPL-Based Clock and Data Recovery Circuit with High Input Jitter Tolerance;" Sun Reprinted from IEEE Journal of Solid-State Circuits, 1989; 4 pages.
U.S. Appl. No. 09/842,966 "Precision Crystal Oscillator Circuit Used in Microcontroller," Mar. 28 pages.
U.S. Appl. No. 09/964,991: "A Novel Band-Gap Circuit for Providing an Accurate Reference Voltage Compensated for Process State, Process Variations and Temperature," Kutz et al.; 25 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/975,115 dated Oct. 9, 2008; 34 pages.
USPTO Final Rejection for U.S. Appl. No. 09/975,115 dated May 12, 2008; 33 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/975,115 dated Jan. 7, 2008; 30 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/975,115 dated Jul. 31, 2007; 28 pages.
USPTO Final Rejection for U.S. Appl. No. 09/975,115 dated Feb. 21, 2007; 25 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/975,115 dated Oct. 31, 2006; 19 pages.
USPTO Final Rejection for U.S. Appl. No. 09/975,115 dated Jun. 23, 2006; 20 pages.

USPTO Non-Final Rejection for U.S. Appl. No. 09/975,115 dated Jan. 11, 2006; 15 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/975,115 dated Jul. 27, 2005; 11 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/975,115 dated Feb. 11, 2005; 86 pages.
USPTO Final Rejection for U.S. Appl. No. 09/975,338 dated Jan. 31, 2008; 21 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/975,338 dated Aug. 14, 2007; 19 pages.
USPTO Final Rejection for U.S. Appl. No. 09/975,338 dated Feb. 27, 2007; 23 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/975,338 dated Sep. 6, 2006; 11 pages.
USPTO Advisory Action for U.S. Appl. No. 09/975,338 dated May 15, 2006; 4 pages.
USPTO Final Rejection for U.S. Appl. No. 09/975,338 dated Jan. 18, 2006; 12 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/975,338 dated Apr. 5, 2005; 13 pages.
USPTO Final Rejection for U.S. Appl. No. 10/008,096 dated Feb. 10, 2005; 15 pages.
USPTO Final Rejection for U.S. Appl. No. 10/008,096 dated Jun. 16, 2008; 23 pages.
USPTO Final Rejection for U.S. Appl. No. 10/008,096 dated Sep. 4, 2007; 19 pages.
USPTO Final Rejection for U.S. Appl. No. 10/008,096 dated Oct. 13, 2006; 17 pages.
USPTO Final Rejection for U.S. Appl. No. 10/008,096 dated Nov. 25, 2005; 17 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/008,096 dated Mar. 7, 2007; 19 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/008,096 dated Apr. 17, 2006; 18 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/008,096 dated Jun. 14, 2004; 24 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/008,096 dated Jun. 24, 2005; 15 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/008,096 dated Dec. 12, 2007; 14 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/008,096 dated Dec. 22, 2008; 24 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/975,105 dated Dec. 4, 2006; 4 pages.
USPTO Final Rejection for U.S. Appl. No. 09/975,105 dated Jul. 13, 2006; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/975,105 dated Jan. 19, 2006; 5 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/975,105 dated Apr. 19, 2005; 9 pages.
U.S. Appl. No. 09/943,062: "Apparatus and Method for Programmable Power Management in a Programmable Analog Circuit Block;" Mar; 46 pages.
U.S. Appl. No. 10/238,966: "Method for Parameterizing a User Module;" Perrin; 41 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/324,455 dated Feb. 12, 2004; 4 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/324,455 dated Nov. 6, 2003; 4 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/324,455 dated Aug. 21, 2003; 4 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/998,859 dated Mar. 14, 2005; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/998,859 dated Nov. 4, 2004; 6 pages.
USPTO Final Rejection for U.S. Appl. No. 09/998,859 dated Nov. 19, 2003; 5 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/998,859 dated May 28, 2003; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/998,859 dated May 15, 2003; 6 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/998,834 dated May 19, 2005; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/998,834 dated Sep. 20, 2004; 11 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/113,065 dated Apr. 6, 2006; 8 pages.
USPTO Final Rejection for U.S. Appl. No. 10/113,065 dated Oct. 26, 2005; 17 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/113,065 dated May 20, 2005; 14 pages.
U.S. Appl. No. 09/207,912: "Circuit(s), Architecture and Method(s) for Operating and/or Tuning a Ring Oscillator;" Mar; 23 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/001,477 dated May 8, 2009; 6 pages.
From U.S. Appl. No. 10/033,027: Goodenough, F. "Analog Counterparts of FPGAS Ease System Design" Electronic Design, Penton Publishing, Cleveland, OH, US vol. 42, No. 21, Oct. 14, 1994; 10 pages.
From U.S. Appl. No. 10/033,027: Harbaum, T. et al. "Design of a Flexible Coprocessor Unit" Proceedings of the Euromicro Conference, XX XX, Sep. 1999; 10 pages.
From U.S. Appl. No. 10/033,027; "Programmable Microcontroller (PSoC) Architecture (Mixed Analog/ Digital)"; Aug. 7, 2001; U.S. Appl. No. 09/924,734 Snyder et al.; 28 pages.
From U.S. Appl. No. 10/033,027; "Digital Configurable Macro Architecture"; Jul. 18, 2001; U.S. Appl. No. 09/909,045; Snyder; 37 pages.
From U.S. Appl. No. 10/033,027; "Configuring Digital Functions in a Digital Configurable Macro Architecture"; Jul. 18, 2001; U.S. Appl. No. 09/909,109; Snyder; 38 pages.
From U.S. Appl. No. 10/033,027: "A Programmable Analog System Architecture (As Amended)"; Jul. 18, 2001; U.S. Appl. No. 09/909,047; Mar; 60 pages.
From U.S. Appl. No. 10/033,027: "Programmable Methodology and Architecture for a Programmable Analog System (As Amended)"; Aug. 14, 2001; U.S. Appl. No. 09/930,021; Mar et al.; 87 pages.
From U.S. Appl. No. 10/033,027: "Method for Synchronizing and Resetting Clock Signals Supplied to Multiple Programmable Analog Blocks (As Amended)"; Oct. 1, 2001; U.S. Appl. No. 09/969,311; Sullam; 57 pages.
From U.S. Appl. No. 10/033,027: "Method and Apparatus for Programming a Flash Memory"; Jun. 5, 2001; U.S. Appl. No. 09/875,599; Snyder; 23 pages.
From U.S. Appl. No. 10/033,027: "In-System Chip Emulator Architecture"; Oct. 10, 2001; U.S. Appl. No. 09/975,115; Snyder et al.; 38 pages.
From U.S. Appl. No. 10/033,027: "A Configurable Input/Output Interface for a Microcontroller"; Sep. 14, 2001; U.S. Appl. No. 09/953,423; Kutz et al.; 28 pages.
From U.S. Appl. No. 10/033,027: "Multiple Use of Microcontroller Pad"; Jun. 26, 2001: U.S. Appl. No. 09/893,050; Kutz et al.; 21 pages.
From U.S. Appl. No. 10/033,027: "Programming Architecture for a Programmable Analog System"; Aug. 14, 2001; U.S. Appl. No. 09/929,891; Mar et al.; 82 pages.
From U.S. Appl. No. 10/033,027: "Architecture for Synchronizing and Resetting Clock Signals Supplied to Multiple Analog Programmable Analog Blocks"; Oct. 1, 2001; U.S. Appl. No. 09/969,313; Sullam; 50 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/994,601 dated Nov. 14, 2006; 15 pages.
USPTO Final Rejection for U.S. Appl. No. 09/994,601 dated Mar. 8, 2006; 11 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/994,601 dated Sep. 21, 2005; 12 pages.
USPTO Final Rejection for U.S. Appl. No. 09/994,601 dated Mar. 24, 2005; 10 pages.
Hintz et al.; "Microcontrollers", 1992, McGraw-Hill; 11 pages.
Ganapathy, Gopi, and Narayan, Ram, and Jorden, Glen, and Fernandez, Denzil, and Wang, Ming, and Nishimura, Jim; "Hardware Emulation for Functional Verification of K5", Jun. 1996, 33rd Design Automation Conference Proceedings, Jun. 3-7, 1996; 4 pages.
The U.S. Appl. No. 60/243,708 "Advanced Programmable Microcontroller Device"; 277 pages.
"Webster's Third New International Dictionary", 1996, G. & C. Merriam Company; 3 pages.

USPTO Advisory Action for U.S. Appl. No. 09/998,848 dated Sep. 7, 2005; 3 pages.
U.S. Appl. No. 09/957,084: "A Crystal-Less Oscillator with Trimmable Analog Current Control for Increased Stability;" Mar; 28 pages.
U.S. Appl. No. 09/969,313: "Architecture for Synchronizing and Resetting Clock Signals Supplied to Multiple Analog Programmable System on a Chip Block;" Sullam; 50 pages.
U.S. Appl. No. 09/972,319: "Method for Applying Instructions to Microprocessor in Test Mode;" Snyder; 31 pages.
U.S. Appl. No. 09/972,003: "Test Architecture for Microcontroller Providing for a Serial Communication Interface;" Snyder; 32 pages.
U.S. Appl. No. 09/972,133: "Method for Entering Circuit Test Mode;" Snyder; 30 pages.
U.S. Appl. No. 09/973,535: "Architecture for Decimation Algorithm:" Snyder; 26 pages.
U.S. Appl. No. 09/977,111: A Frequency Doubler Circuit with Trimmable Current Control; Shutt; 35 pages.
U.S. Appl. No. 10/272,231: "Digital Configurable Macro Architecture;" Snyder; 36 pages.
U.S. Appl. No. 11/125,554: "A Method for a Efficient Supply to a Microcontroller;" Kutz; 1 page.
U.S. Appl. No. 09/855,868: "Protecting Access to Microcontroller Memory Blocks;" Snyder, 28 pages.
U.S. Appl. No. 09/887,923: "Novel Method and System for Interacting between a Processor and a Power on Reset to Dynamically Control Power States in a Microcontroller;" Kutz; 44 pages.
U.S. Appl. No. 10/000,383: "System and Method of Providing a Programmable Clock Architecture for an Advanced Microcontroller;" Sullam; 34 pages.
U.S. Appl. No. 10/001,477: "Breakpoint Control in an In-Circuit Emulation System:" Roe; 43 pages.
U.S. Appl. No. 10/004,197: "In-Circuit Emulator with Gatekeeper Based Halt Control," Nemecek; 47 pages.
U.S. Appl. No. 10/004,039: "In-Circuit Emulator with Gatekeeper for Watchdog Timer;" Nemecek; 46 pages.
U.S. Appl. No. 10/002,217: "Conditional Branching in an In-Circuit Emulation System," Nemecek; 43 pages.
U.S. Appl. No. 10/001,568: "Combined In-Circuit Emulator and Programmer;" Nemecek; 47 pages.
U.S. Appl. No. 10/001,478: "In-Circuit Emulator and POD Synchronized Boot;" Nemecek; 44 pages.
U.S. Appl. No. 09/887,955: "Novel Power on Reset Circuit for Microcontroller;" Kutz; 42 pages.
U.S. Appl. No. 09/826,397: "Method and Circuit for Allowing a Microprocessor to Change its Operating Frequency on-the-fly;" Sullam; 24 pages.
U.S. Appl. No. 09/893,048: "A Microcontroller having an On-Chip High Gain Amplifier;" Kutz; 22 pages.
U.S. Appl. No. 09/912,768: "A Microcontroller having a Dual Mode Relax Oscillator that is Trimmable;" Shutt; 33 pages.
U.S. Appl. No. 09/922,419: "A Power Supply Pump Circuit for a Microcontroller;" Kutz; 38 pages.
U.S. Appl. No. 09/922,579: "A Method for a Efficient Supply to a Microcontroller;" Kutz; 37 pages.
U.S. Appl. No. 09/923,461: "Non-Interfering Multiply-Mac (Multiply Accumulate) Circuit:" Snyder: 25 pages.
U.S. Appl. No. 09/935,454: "Method and Apparatus for Local and Global Power Management in a Programmable Analog Circuit;" Mar; 51 pages.
U.S. Appl. No. 10/011,214: "Method and Circuit for Synchronizing a Write Operation between an On-Chip Microprocessor and an On-Chip Programmable Analog Device Operating at Different Frequencies;" Sullam; 49 pages.
Bursky, "FPGA Combines Multiple Interfaces and Logic," Electronic Design, vol. 48 No. 20, pp. 74-78 (Oct. 2, 2000); 5 pages.
Anonymous, "Warp Nine Engineering—The IEEE 1284 Experts-F/Port Product Sheet," undated web page found at http://www.fapo.com/fport.htm; 2 pages.
Anonymous, "F/Port:Fast Parallel Port for the PC Installation Manual" Release 7.1, circa 1997, available for download from http://www.fapo.com/fport.htm 25 pages.
Nam et al.; "Fast Development of Source-Level Debugging System Using Hardware Emulation"; IEEE 2000; 4 pages.
Huang et al.; "Iceberg: An Embedded In-Cicuit Emulator Synthesizer for Microcontrollers"; ACM 1999; 6 pages.
Khan et al.; "FPGA Architectures for Asic Hardware Emulators"; IEEE 1993; 5 pages.
Oh et al.; Emulator Environment Based on an FPGA Prototyping Board; IEEE 21-23; Jun. 2000; 6 pages.
Hong et al.; "An FPGA-Based Hardware Emulator for Fast Fault Emulation"; IEEE 1997; 4 pages.
Ching et al.; "An In-Curcuit-Emulator for TMS320C25"; IEEE 1994; 6 pages.
Pasternak; "In-Circuit-Emulation in ASIC Architecture Cor Designs"; IEEE 1989; 4 pages.
Melear: "Using Background Modes for Testing, Debugging and Emulation of Microcontrollers"; IEEE 1997; 8 pages.
Walters, Stephen; "Computer-Aided Prototyping for ASIC-Based Systems", 1991, IEEE Design & Test of Computers; vol. 8, Issue 2; 8 pages.
Anonymous; "JEEN JTAG Embedded Ice Ethernet Interface"; Aug. 1999; Embedded Performance, Inc.; 3 pages.
Sedory; "A Guide to Debug"; 2004; retrieved on May 20, 2005; 7 pages.
"Microsoft Files Summary Judgement Motions"; Feb. 1999; Microsoft PressPass; retrieved on May 20, 2005 from http://www.microsoft.com/presspass/press/1999/feb99/Feb99/Calderapr.asp; 3 pages.
Xerox; "Mesa Debugger Documentation"; Apr. 1979; Xerox Systems Development Department; Version 5.0; 33 pages.
Stallman et al.; "Debugging with the GNU Source-Level Debugger"; Jan. 1994; retrieved on May 2, 2005 from http://www.cs.utah.edu; 4 pages.
Wikipedia.org; "Von Neumann architecture"; retrieved from http://en.wikipedia.org/wiki/Von_Neumann_architecture on Jan. 22, 2007; 4 pages.
Stan Augarten; "The Chip Collection—Introduction—Smithsonian Institute"; "State of the Art"; "The First 256-Bit Static RAM"; retrieved on Nov. 14, 2005 from http://smithsonianchips.si.edu/augarten/p24.htm; 2 pages.
"POD—Piece of Data, Plain Old Documentation, Plain Old Dos . . . "; retrieved on Nov. 14, 2005 from http://www. auditmypc.com/acronym/POD.asp; 2 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,767 dated Oct. 6, 2004; 15 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,771 dated Feb. 27, 2007; 8 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,771 dated Mar. 28, 2006; 9 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,771 dated Apr. 6, 2005; 7 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,771 dated Dec. 10, 2008; 12 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,771 dated Dec. 27, 2007; 15 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,771 dated May 28, 2008; 14 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,771 dated Jul. 16, 2007; 14 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,771 dated Aug. 23, 2006; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,771 dated Sep. 12, 2005; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,771 dated Sep. 22, 2004; 7 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,765 dated Apr. 3, 2007; 12 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,765 dated Apr. 4, 2008; 16 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,765 dated Apr. 17, 2006; 12 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,765 dated Sep. 19, 2007; 14 pages.

USPTO Non-Final Rejection for U.S. Appl. No. 09/989,765 dated Sep. 26, 2008; 17 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,765 dated Oct. 2, 2006; 13 pages.
Uspto Non-Final Rejection for 09/989,765 (CD01194M) dated Oct. 5, 2005; 9 pages.
USPTO Final Rejection for U.S. Appl. 09/989,782 dated Jul. 9, 2008; 10 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,782 dated Jul. 24, 2007; 9 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,782 dated Sep. 21, 2006; 10 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,782 dated Nov. 3, 2005; 11 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,782 dated Jan. 29, 2007; 9 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,782 dated Mar. 28, 2006; 8 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,782 dated Apr. 29, 2005; 11 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,782 dated Oct. 6, 2004; 11 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,782 dated Nov. 26, 2008; 10 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,782 dated Dec. 14, 2007; 8 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,765 dated Mar. 31, 2009; 18 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,778 dated Mar. 16, 2009; 26 pages.
"Pod-Wikipedia, the free encyclopedia"; retrieved on Nov. 14, 2005 from http://en.wikipedia.org/wiki/Pod; 3 pages.
"pod-defintion by dict.die.net"; retrieved on Nov. 14, 2005 from http://dict.die.net/pod; 2 pages.
"In-Curcuit Emulators—descriptions of the major ICEs around"; retrieved on Nov. 14, 2005 from http://www.algonet.se/~staffann/developer/emulator.htm; 6 pages.
"Capturing Test/Emulation and Enabling Real-Time Debugging Using FPGA for In-Circuit Emulation;" Oct. 10, 2001; U.S. Appl. No. 09/975,104; Snyder; 35 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,767 dated Jul. 24, 2008; 21 pages.
Anonymous; "Using Debug"; 1999; Prentice-Hall Publishing; 20 pages.
Harrison et al.; "Xilinx FPGA Design in a Group Environment Using VHDS and Synthesis Tools"; Colloquium on Digital System Design Using Synthesis Techniques; Feb. 15, 1996; 4 pages.
Microsoft Press Computer User's Dictionary; 1998; 3 pages.
Sreeram Duvvuru and Siamak Arya, "Evaluation of a Branch Target Address Cache," 1995; IEEE; 8 pages.
Andrew S. Tanenbaum with contributions from James R. Goodman, "Structured Computer Organization," 1999, Prentice Hall, Fourth Edition; 32 pages.
"Method for Breaking Execution of a Test Code in DUT and Emulator Chip Essentially Simultaneously and Handling Complex Breakpoint Events;" Oct. 10, 2001; U.S. Appl. No. 09/975,338; Nemecek et al.; 34 pages.
"Emulator Chip-Board Architecture for Interface;" Oct. 10, 2001; U.S. Appl. No. 09/975,030; Snyder et al.; 37 pages.
Wikipedia—Main Page, retrieved on Mar. 8, 2006 from http://en.wikipedia.org/wiki/Main_Page and http://en.wikipedia.org/wiki/Wikipedia:Introduction; 5 pages.
Wikipedia—Processor register, retrieved on Mar. 7, 2006 from http://en.wikipedia.org/wiki/Processor_register; 4 pages.
Jonathan B. Rosenburg, "How Debuggers Work" John Wiley & Sons, Inc. 1996; 259 pages.
Dahl, et al.; "Emulation of the Sparcle Microprocessor with the MIT Virtual Wires Emulation System"; 1994; IEEE; 9 pages.
Bauer et al.; "A Reconfigurable Logic Machine for Fast Event-Driven Simulation"; 1998; Design Automation Conference Proceedings; 8 pages.
"Host to FPGA Interface in an In-Circuit Emulation System;" Oct. 10, 2001; U.S. Appl. No. 09/975,105; Nemecek; 44 pages.
USPTO Advisory Action for U.S. Appl. No. 09/994,601 dated May 23, 2006; 3 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/994,601 dated Jul. 29,2004; 10 pages.
USPTO Ex Parte Qualyle Action for U.S. Appl. No. 09/992,076 dated Jun. 18, 2007; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/992,076 dated Aug. 10, 2006; 19 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/992,076 dated Mar. 26, 2008; 23 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/992,076 dated Jul. 29, 2008; 6 pages.
USPTO Advisory Action for U.S. Appl. No. 09/989,778 dated May 15, 2006; 4 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,778 dated Jan. 8, 2009; 25 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,778 dated Feb. 5, 2007; 17 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,778 dated Feb. 15, 2006; 9 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,778 dated Dec. 20, 2007; 14 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,778 dated Mar. 29, 2005; 14 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,778 dated Jul. 14, 2008; 24 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,778 dated Jul. 19, 2007; 18 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,778 dated Sep. 1, 2005; 10 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,778 dated Sep. 18, 2006; 11 pages.
USPTO Final Rejection for U.S. Appl. No. 09/998,848 dated Jun. 14, 2005; 17 pages.
USPTO Final Rejection for U.S. Appl. No. 09/998,848 dated Jul. 25, 2006; 16 pages.
USPTO Final Rejection for U.S. Appl. No. 09/998,848 dated Aug. 10, 2007; 14 pages.
USPTO Final Rejection for U.S. Appl. No. 09/998,848 dated Nov. 24, 2008; 15 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/998,848 dated Jan. 26, 2006; 17 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/998,848 dated Jan. 29, 2007; 13 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/998,848 dated Feb. 22, 2008; 15 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/998,848 dated Dec. 21, 2004; 14 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,767 dated Jan. 11, 2007; 12 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,767 dated Jan. 15, 2009; 21 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,767 dated Mar. 6, 2006; 15 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,767 dated Apr. 6, 2005; 13 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,767 dated Dec. 27, 2007; 21 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,767 dated Jul. 17, 2006; 12 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,767 dated Jul. 2, 2007; 22 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/992,076 dated Nov. 13, 2008; 15 pages.
USPTO Final Rejection for U.S. Appl. No. 09/994,601 dated May 18, 2007; 17 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/992,076 dated Nov. 29, 2007; 8 pages.
USPTO Final Rejection for U.S. Appl. No. 09/992,076 dated Jan. 30, 2007; 32 pages.
USPTO Final Rejection for U.S. Appl. No. 09/992,076 dated Mar. 17, 2006; 16 pages.

USPTO Non-Final Rejection for U.S. Appl. No. 09/992,076 dated Nov. 21, 2005; 29 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/992,076 dated Jun. 1, 2005; 20 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/994,600 dated Nov. 12, 2008; 35 pages.
USPTO Notice of Allowance for 09/994,600 dated May 14, 2008; 22 pages.
USPTO Final Rejection for U.S. Appl. No. 09/994,600 dated Oct. 17, 2007; 13 pages.
Uspto Non-Final Rejection for 09/994,600 (CD01174) dated May 15, 2007; 14 pages.
USPTO Final Rejection for U.S. Appl. No. 09/994,600 dated Dec. 8, 2006; 14 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/994,600 dated Jul. 17, 2006; 14 pages.
USPTO Final Rejection for U.S. Appl. No. 09/994,600 dated Feb. 13, 2006; 13 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/994,600 dated Aug. 23, 2005; 13 pages.
USPTO Final Rejection for U.S. Appl. No. 09/994,600 dated May 4, 2005; 16 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/994,600 dated Oct. 21, 2004; 37 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/001,477 dated Nov. 10, 2008; 13 pages.
USPTO Final Rejection for U.S. Appl. No. 10/001,477 dated Jun. 30, 2008; 19 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/001,477 dated Dec. 6, 2007; 17 pages.
USPTO Final Rejection for U.S. Appl. No. 10/001,477 dated Jul. 23, 2007; 19 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/001,477 dated Jan. 22, 2007; 17 pages.
USPTO Final Rejection for U.S. Appl. No. 10/001,477 dated Aug. 24, 2006; 15 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/001,477 dated Mar. 2, 2006; 17 pages.
USPTO Final Rejection for U.S. Appl. No. 10/001,477 dated Oct. 24, 2005; 18 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/001,477 dated May 11, 2005; 31 pages.
Ito, Sergio Akira and Carro, Luigi; "A Comparison of Microcontrollers Targeted to FPGA-Based Embedded Applications", Sep. 2000, Proceedings of 13th Symposium on Integrated Circuits and Systems Design, Sep. 18-24, 2000; 6 pages.
Julio Faura et al.; "A Novel Mixed Signal Programmable Device With On-Chip Microprocessor", 1997, IEEE 1997 Custom Integrated Circuits Conference; 4 pages.
Monte Mar, Bert Sullam, Eric Blom; "An architecture for a configurable Mixed-signal device", 2003, IEEE Journal of Solid-State Circuits, vol. 3; 4 pages.
Robinson, Gordon D; "Why 1149.1 (JTAG) Really Works", May 1994, Conference Proceedings Electro/94 International, May 10-12, 1994, Combined Volumes; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/994,601 dated Oct. 4, 2007; 20 pages.
"PSoC designer: Integrated development environment, getting started 25-minute tutorial, version 1.0", Cypress Microsystems., Cypress Microsystems, Inc. CMS10006A, Jul. 3, 2001; 25 pages.
"PSoC technology complete changes 8-bit MCU system design", Cypress Microsystems, Inc. retrieved from <http>://www.archive.org/web/20010219005250/http://cypressmicro.com-/t . . .>, Feb. 19, 2001; 21 pages.
Specks et al., "A Mixed Digital-Analog 16B Microcontroller with 0.5MB Flash Memory, On-Chip Power Supply, Physical Nework Interface, and 40V I/O for Automotive Single-Chip Mechatronics," IEEE, Feb. 9, 2000; 1 page.
Hsieh et al., "Modeling Micro-Controller Peripherals for High-Level Co-Simulation and Synthesis," IEEE, 1997; 4 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/989,777 dated Nov. 4, 2008; 3 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/989,777 dated Sep. 15, 2008; 28 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/989,777 dated Jul. 7, 2008; 23 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,777 dated Jan. 30, 2008; 14 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,777 dated Sep. 11, 2007; 18 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,777 dated Mar. 13, 2007; 24 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,777 dated Sep. 13, 2006; 18 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,777 dated Apr. 11, 2006; 21 pages.
USPTO Final Rejection for U.S. Appl. 09/989,777 dated Dec. 21, 2005; 29 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,777 dated Jul. 5, 2005; 36 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/994,601 dated Dec. 22, 2008; 15 pages.
USPTO Final Rejection for U.S. Appl. No. 09/994,601 dated Apr. 17, 2008; 24 pages.
U.S. Appl. No. 10/033,027: "Microcontrollable Programmable System on a Chip;" Snyder; 117 pages.
U.S. Appl. No. 10/803,030: "Programmable Microcontrollable Architecture (Mixed Analog/Digital);" Snyder; 13 pages.
"New Object Domain R3 Beta Now Available (Build 134)!" Mar. 13, 2001; <http://web.archive.org/web/20010033120260 5/www.objectdomain.com/domain30/index.html>; 2 pages.
"OMG XML Metadata Interchange (XMI) Specifications" 2000; 17 pages.
Electronic Tools Company; E-Studio User Manuel; 2000; retrieved from http://web.archive.org for site http://e-tools.com on Mar. 23, 2005; 77 pages.
Cover Pages Technology Reports; XML and Electronic Design Automation (EDA); Aug. 2000; retrieved from http://xml.coverpages.org on Mar. 23, 2005; 5 pages.
Microsoft Computer Dictionary "ActiveX" 2002; Microsoft Press; 5th Edition; 3 pages.
Wikipedia "XLM" retrieved on Jan. 29, 2007 from http://en.wikipedia.org/wiki/XML; 16 pages.
"VHDL Samples" retrieved on Jan. 29, 2007 from http://www.csee.umbc.edu/help/VHDL/samples/samples.shtml; 10 pages.
Anonymous, "Lotus Notes FAQ—How do you generate unique document numbers?" Sep. 19, 1999; retrieved from www.keysolutions.com on Jul. 9, 2008; 1 page.
Ashok Bindra, "Programmable SoC Delivers A New Level of System Flexibility"; Electronic Design; Nov. 6, 2000; 11 pages.
Cypress MicroSystem, Inc. "Cypres Customer Forums" retrieved from <http://www.cypress.com/forums/messageview>: 1 page.
Cypress MicroSystem, Inc. "PsoC Designer: Integrated Development Environment User Guide"; Rev. 1.18; Sep. 8, 2003; 193 pages.
Hamblen, "Rapid Prototyping Using Field-Programmable Logic Devices" Jun. 2000, IEEE; 9 pages.
USPTO Final Rejection for U.S. Appl. No. 09/943,062 dated Apr. 30, 2004; 9 pages.
Snyder et al., "Xilinx's A-to-Z Systems Platform" Cahners Microprocessor, The Insider's Guide to Microprocessor Hardware. Feb. 6, 2001; 6 pages.
"PSoC Technology Completely Changes 8-bit MCU System Design" Cypress MicroSystem, Inc. Feb. 19, 2001; 21 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/943,062 dated Dec. 8, 2003; 9 pages.
USPTO Advisory Action for U.S. Appl. No. 09/943,062 dated Sep. 25, 2003; 3 pages.
USPTO Final Rejection for U.S. Appl. No. 09/943,062 dated Jun. 27, 2003; 8 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/943,062 dated Jan. 27, 2003; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/943,062 dated Sep. 11, 2002; 9 pages.
"PSoC Designer: Integrated Development Environment" User Guide; Revision 1.11; Last Revised Jul. 17, 2001; 109 pages.

Cypress Microsystems, "Cypress Microsystems Unveils Programmable System-on-a-Chip for Embedded Internet, Communications and Consumer Systems;" 2000, <http://www.cypressmicro.com/corporate/CY_Announces_nov_13_2000.html>; 3 pages.
Huang et al., ICEBERG, An Embedded In-Circuit Emulator Synthesizer for Microcontrollers, Proceedings of the 36th Design Automation Conference 1999; 6 pages.
Yoo et al., "Fast Hardware-Software Co-verification by Optimistic Execution of Real Processor," Proceedings of Design, Automation and Test in Europe Conference and Exhibition 2000; 6 pages.
USPTO Advisory Action for U.S. Appl. No. 09/943,062 dated Mar. 27, 2008; 3 pages.
USPTO Final Rejection for U.S. Appl. No. 09/943,062 dated Jan. 18, 2008; 8 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/943,062 dated Jun. 22, 2007; 12 pages.
USPTO Miscellaneous Action for U.S. Appl. No. 09/943,062 dated Jan. 30, 2006; 2 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/113,064 dated Sep. 21, 2006; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/113,064 dated Apr. 6, 2006; 19 pages.
USPTO Final Rejection for U.S. Appl. No. 10/113,064 dated Oct. 18, 2005; 22 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/113,064 dated Apr. 25, 2005; 15 pages.
U.S. Appl. No. 10/113,064: "Method and System for Debugging through Supervisory Operating Codes and Self Modifying Codes," Roe et al.; 36 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/930,021 dated Nov. 26, 2004; 4 pages.
USPTO Final Rejection for U.S. Appl. No. 09/930,021 dated Aug. 31, 2004; 8 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/930,021 dated Apr. 26, 2004; 6 pages.
USPTO Miscellaneous Action with SSP for U.S. Appl. No. 09/930,021 dated Oct. 1, 2001; 1 page.
USPTO Notice of Allowance for U.S. Appl. No. 09/953,423 dated Jul. 12, 2004; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/953,423 dated Feb. 6, 2004; 5 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/957,084 dated May 18, 2004; 5 pages.
USPTO Final Rejection for U.S. Appl. No. 09/957,084 dated Jan. 29, 2004; 8 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/957,084 dated Aug. 27, 2003; 8 pages.
USPTO Final Rejection for U.S. Appl. No. 09/957,084 dated Apr. 23, 2003; 8 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/957,084 dated Aug. 23, 2002; 6 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/969,313 dated Oct. 4, 2005; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/969,313 dated May 6, 2005; 9 pages.
USPTO Requirement for Restriction/Election for U.S. Appl. No. 09/969,313 dated Mar. 18, 2005; 6 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/969,311 dated Mar. 1, 2005; 4 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/969,311 dated Sep. 21, 2004; 4 pages.
USPTO Advisory Action for U.S. Appl. No. 09/969,311 dated Jul. 21, 2003; 2 pages.
USPTO Final Rejection for U.S. Appl. No. 09/969,311 dated Apr. 7, 2003; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/969,311 dated Nov. 6, 2002; 8 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/972,319 dated Dec. 30, 2004; 4 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/972,319 dated Sep. 16, 2004; 9 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/972,003 dated Jul. 14, 2004; 4 pages.
USPTO Requirement for Restriction/Election for U.S. Appl. No. 09/972,003 dated May 6, 2004; 4 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/972,003 dated Feb. 2, 2004; 10 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/972,003 dated Aug. 19, 2003; 11 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/972,133 dated Jun. 9, 2006; 6 pages.
USPTO Final Rejection for U.S. Appl. No. 09/972,133 dated Mar. 30, 2006; 8 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/972,133 dated Nov. 25, 2005; 9 pages.
USPTO Advisory Action for U.S. Appl. No. 09/972,133 dated Aug. 31, 2005; 3 pages.
USPTO Final Rejection for U.S. Appl. No. 09/972,133 dated Jun. 29, 2005; 10 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/972,133 dated Mar. 8, 2005; 9 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/975,104 dated Oct. 19, 2006; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/975,104 dated Jun. 16, 2006; 8 pages.
U SPTO Final Rejection for U.S. Appl. No. 09/975,104 dated Feb. 15, 2006; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/975,104 dated Aug. 16, 2005; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/975,104 dated Mar. 21, 2005; 7 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/975,030 dated Feb. 6, 2006; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/975,030 dated Oct. 20, 2005; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/975,030 dated Mar. 29, 2005; 13 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/977,111 dated Sep. 28, 2006; 6 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/272,231 dated Mar. 8, 2004; 6 pages.
USPTO Final Rejection for U.S. Appl. No. 10/272,231 dated Nov. 5, 2003; 5 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/272,231 dated Jul. 14, 2003; 6 pages.
USPTO Notice of Allowance for U.S. Appl. No. 11/125,554 dated Feb. 7, 2008; 4 pages.
USPTO Notice of Allowance for U.S. Appl. No. 11/125,554 dated Apr. 24, 2007; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/125,554 dated Dec. 11, 2006; 9 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/855,868 dated Apr. 25, 2005; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/855,868 dated Aug. 26, 2004; 7 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/887,923 dated Sep. 27, 2004; 5 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/887,923 dated May 25, 2004; 7 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/875,599 dated Oct. 17, 2006; 4 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/875,599 dated May 31, 2006; 18 pages.
USPTO Final Rejection for U.S. Appl. No. 09/875,599 dated Feb. 15, 2006; 18 pages.
USPTO Final Rejection for U.S. Appl. No. 09/875,599 dated Nov. 21, 2005; 16 pages.
USPTO Advisory Action for U.S. Appl. No. 09/875,599 dated Jun. 8, 2005; 3 pages.
USPTO Final Rejection for U.S. Appl. No. 09/875,599 dated Mar. 29, 2005; 20 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/875,599 dated Dec. 3, 2004; 16 pages.
USPTO Final Rejection for U.S. Appl. No. 09/875,599 dated Aug. 25, 2004; 17 pages.

USPTO Final Rejection for U.S. Appl. No. 09/875,599 dated Apr. 26, 2004; 15 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/875,599 dated Oct. 27, 2003; 13 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/004,197 dated Feb. 9, 2007; 7 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/004,197 dated Oct. 6, 2006; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/004,197 dated Apr. 3, 2006; 13 pages.
USPTO Final Rejection for U.S. Appl. No. 10/004,197 dated Nov. 23, 2005; 17 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/004,197 dated Jun. 6, 2005; 21 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/004,039 dated Aug. 15, 2006; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/004,039 dated Apr. 11, 2006; 14 pages.
USPTO Final Rejection for U.S. Appl. No. 10/004,039 dated Nov. 22, 2005; 19 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/004,039 dated Jun. 6, 2005; 17 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/001,568 dated Mar. 17, 2006, 9 pages.
USPTO Final Rejection for U.S. Appl. No. 10/001,568 dated Oct. 26, 2005; 16 pagee.
USPTO Non-Final Rejection for U.S. Appl. No. 10/001,568 dated May 19, 2005; 16 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/887,955 dated Oct. 12, 2004; 5 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/887,955 dated May 26, 2004; 5 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/826,397 dated Oct. 7, 2004; 8 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/826,397 dated Apr. 21, 2004; 6 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/893,048 dated Jul. 25, 2006; 4 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/893,048 dated Jan. 12, 2006; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/893,048 dated Jul. 27, 2005; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/893,048 dated Oct. 6, 2004; 5 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/893,050 dated Jul. 5, 2005; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/893,050 dated Jan. 5, 2005; 13 pages.
USPTO Final Rejection for U.S. Appl. No. 09/893,050 dated Aug. 30, 2004; 13 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/893,050 dated Jan. 15, 2004; 9 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/909,047 dated May 11, 2005; 25 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/909,047 dated Feb. 15, 2005; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/909,047 dated Jul. 6, 2004; 9 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/912,768 dated Sep. 13, 2005; 5 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/912,768 dated Apr. 11, 2005; 14 pages.
USPTO Final Rejection for U.S. Appl. No. 09/912,768 dated Nov. 17, 2004; 13 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/912,768 dated Jun. 22, 2004; 11 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/922,579 dated Dec. 28, 2004; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/922,579 dated Aug. 18, 2004; 6 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/923,461 dated May 12, 2005; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/923,461 dated Jul. 16, 2004; 6 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/929,891 dated Dec. 23, 2005; 4 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/929,891 dated Jun. 15, 2005; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/929,891 dated Sep. 13, 2004; 6 pages.
USPTO Notice of Allowance for U.S. Application No. 10/803,030 dated Jan. 8, 2007; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/803,030 dated Jun. 8, 2005; 4 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/011,214 dated Apr. 11, 2005; 4 pages.
USPTO Final Rejection for U.S. Appl. No. 10/011,214 dated Jan. 21, 2005; 8 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/011,214 dated Aug. 13, 2004; 10 pages.
Hong et al., "Hierarchial System Test by an IEEE 1149.5 MTM-Bus Slave-Module Interface Core," IEEE, 2000; 14 pages.
Haberl et al., "Self Testable Boards with Standard IEEE 1149.5 Module Test and Maintenance (MTM) Bus interface," IEEE, 1994; 6 pages.
Varma et al., "A Structured Test Re-Use Methodology for Core-Based System Chips," IEEE, 1998; 9 pages.
Andrews, "Roadmap for Extending IEEE 1149.1 for Hierarchical Control of Locally-Stored, Standardized command Set, Test Programs," IEEE, 1994; 7 pages.
Adham et al., "Preliminary Outline of the IEEE P1500 Scalable Architecture for Testing Embedded Cores," IEEE; 6 pages.
Ghosh et al., "A Low Overhead Design for Testability and Test Generation Technique for Core-based Systems," IEEE, 1997; 10 pages.
Zorian, "Test Requirements for Embedded Core-based Systems and IEEE P1500," IEEE, 1997; 9 pages.
Zorian et al., "Testing Embedded-Core Based System Chips," IEEE, 1998; 14 pages.
Papachristou et al., "Microprocessor Based Testing for Core-Based System on a Chip," IEEE, 1999; 6 pages.
Maroufi et al., "Solving the I/O Bandwidth Problem in System on a Chip Testing," IEEE, 2000; 6 pages.
Marsh, "Smart Tools Illuminate Deeply Embedded Systems," EDN, 2000; 7 pages.
York et al., "On-chip Support Needed for SOC Debug," Electronic Engineering Times, 1999; 2 pages.
Atmel Corporation: AT9OSC Summary: "Secure Microcontrollers for Smart Cards," 1999; 7 pages.
Hwang et al., "Integrated circuit for automatically varying resistance in computer system, has pair of transistors connected in parallel with respective resistors such that resistors are bypassed when corresponding transistors are enabled," Derwent Information LTD; 2002; 2 pages.
Morrison, "IBM Eyes Merchant Packaging Services," Jul. 13, 1998; Electronic News <http://www.findarticles.com>; 4 pages.
Charles, Jr. et al., "Wirebonding: Reinventing the Process for MCMs," Apr. 1998; IEEE 7th International Conference on Multichip Modules and High Density Packaging; 3 pages.
Tran et al., "Fine Pitch and Wirebonding and Reliability of Aluminum Capped Copper Bond Pads," May 2000, IEEE Electronic Components and Technology Conference; 8 pages.
Song et al., "A 50% Power Reduction Scheme for CMOS Relaxation Oscillator," IEEE, 1999; 4 pages.
"Electronic Circuit Protector-Circuit Breaker;" IBM Technical Disclosure Bulletin; vol. 36, Issue 8, Aug. 1, 1993; 1 page.
USPTO Final Rejection for U.S. Appl. No. 10/001,478 dated Apr. 20, 2009; 16 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/994,600 dated Apr. 3, 2009; 5 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/989,777 dated Mar. 9, 2009; 7 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/992,076 dated Feb. 27, 2009; 6 pages.

USPTO Non-Final Rejection for U.S. Appl. No. 09/989,771 dated Apr. 30, 2009; 11 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/989,762 dated Mar. 25, 2009; 7 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/989,762 dated Oct. 24, 2008; 7 pages.
U.S. Appl. No. 09/989,815: "A Data Driven Method and System for Monitoring Hardware Resource Usage for Programming an Electric Device;" Bartz et al.; 36 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/989,762 dated Jun. 2, 2008; 6 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/989,762 dated Jan. 2, 2008; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,762 dated Jul. 23, 2007; 15 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,762 dated Jan. 26, 2007; 13 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,762 dated Aug. 10, 2006; 18 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,762 dated Mar. 14, 2006; 19 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,762 dated Jul. 27, 2005; 15 pages.
U.S. Appl. No. 09/275,336: "Programmable Oscillator Scheme;" Mar et al.; 25 pages.
U.S. Appl. No. 09/721,316: "Programmable Oscillator Scheme," Mar et al.; 26 pages.
U.S. Appl. No. 10/324,455: "Programmable Oscillator Scheme;" Mar et al.; 23 pages.
U.S. Appl. No. 09/998,859: "A System and a Method for Checking Lock Step Consistency between in Circuit Emulation and a Microcontroller while Debugging Process is in Progress;" Nemecek; 33 pages.
U.S. Appl. No. 09/998,834: "A System and a Method for Communication between and Ice and a Production Microcontroller while in a Halt State;" Nemecek; 33 pages.
U.S. Appl. No. 10/113,065; "System and Method for Automatically Matching Components in a Debugging System;" Nemecek et al.; 32 pages.
U.S. Appl. No. 09/989,574: "Method and System for using a Graphics user Interface for Programming an Electronic Device;" Bartz et al.; 43 pages.
U.S. Appl. No. 09/989,816: "Datasheet Browsing and Creation with Data-Driven Datasheet Tabs within a Microcontroller Design Tool;" Bartz et al.; 55 pages.
U.S. Appl. No. 11/322,044, filed Dec. 28, 2005, Stiff, Johnathon.
U.S. Appl. No. 11/850,260: "Circuit and Method for Improving the Accuracy of a Crystal-less Oscillator Having Dual-Frequency Modes;" Wright et al.; 33 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/850,260 dated Mar. 6, 2009; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/644,100 dated Mar. 9, 2009: 11 pages.
USPTO Advisory Action for U.S. Appl. No. 11/644,100 dated Feb. 9, 2009; 3 pages.
USPTO Final Rejection for U.S. Appl. No. 11/644,100 dated Nov. 18, 2008; 12 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/644,100 dated Apr. 14, 2008; 10 pages.
USPTO Notice of Allowance for U.S. Appl. No. 11/415,588 dated Mar. 11, 2008; 6 pages.
USPTO Advisory Action for U.S. Appl. No. 11/415,588 dated Jan. 14, 2008; 3 pages.
USPTO Final Rejection for U.S. Appl. No. 11/415,588 dated Oct. 19, 2007; 8 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/415,588 dated Jun. 13, 2007; 8 pages.
USPTO Notice of Allowance for U.S. Appl. No. 12/218,404 dated Mar. 19, 2009; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 12/218,404 dated Sep. 30, 2008; 8 pages.
U.S. Appl. No. 11/644,100: "Differential-to-single ended signal converter circuit and method," Stiff; 33 pages.
U.S. Appl. No. 11/415,588: "Voltage Controlled Oscillator Delay Cell and Method," Sivadasan; 24 pages.
U.S. Appl. No. 12/218,404: "Voltage Controlled Oscillator Delay Cell and Method," Sivadasan; 23 pages.
USPTO Notice of Allowance for U.S. Appl. No. 11/132,894 dated Apr. 26, 2007; 4 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/132,894 dated Dec. 19, 2006; 12 pages.
U.S. Appl. No. 11/132,894: "Open Loop Bandwidth Test Architecture and Method for Phase Locked Loop (PLL)," Stiff; 38 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/322,044 dated May 4, 2009; 18 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/322,044 dated Nov. 25, 2008; 15 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/322,044 dated Apr. 11, 2008; 11 pages.
USPTO Advisory Action for U.S. Appl. No. 11/322,044 dated Nov. 30, 2007; 2 pages.
USPTO Final Rejection for U.S. Appl. No. 11/322,044 dated Sep. 21, 2007; 14 pages.
Uspto Non-Final Rejection for U.S. Appl. No. 11/322,044 (CD05198) dated Apr. 24, 2007; 13 pages.
U.S. Appl. No. 11/322,044: "Split charge pump PLL architecture," Stiff; 19 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/305,589 dated Feb. 4, 2005; 5 pages.
USPTO Final Rejection for U.S. Appl. No. 10/305,589 dated Oct. 21, 2004; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/305,589 dated Oct. 7, 2003; 6 pages.
U.S. Application No. 10/305,589: "Current Controlled Delay Circuit," Stiff; 18 pages.
U.S. Appl. No. 09/849,164: "Reduced Static Phase Error CMOS PLL Charge Pump," Stiff; 30 pages.
Maneatis, "Low-Jitter Process-Independent DLL and PLL Based on Self-Biased Techniques," IEEE Journal of Solid-State Circuits, vol. 31, No. 11, Nov. 1996; 10 pages.
Larsson, "A 2-1600-MHz CMOS Clock Recovery PLL with Low-V dd Capability," IEEE Journal of Solid-State Circuits, Vol. 34, No. 12, Dec. 1999; 10 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/327,217 dated Aug. 12, 2004; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/327,217 dated Apr. 30, 2004; 5 pages.
USPTO Miscellaneous Action for U.S. Appl. No. 10/327,217 dated Feb. 10, 2004; 1 page.
U.S. Appl. No. 10/327,217 (CD02174): "Single Ended Clock Signal Generator Having a Differential Output," Richmond et al.; 27 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/871,582 dated Mar. 30, 2006; 6 pages.
USPTO Final Rejection for U.S. Appl. No. 10/871,582 dated Feb. 1, 2006; 5 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/871,582 dated Sep. 7, 2005; 7 pages.
U.S. Appl. No. 10/871,582: "LVDS Input Circuit with Extended Common Mode Range," Reinschmidt et al.; 25 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/404,891 dated Mar. 4, 2005; 6 pages.
USPTO Final Rejection for U.S. Appl. No. 09/404,891 dated Dec. 8, 2004; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/404,891 dated Jun. 25, 2004; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/404,891 dated Jan. 5, 2004; 5 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/404,891 dated Jul. 10, 2003; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/404,891 dated Mar. 5, 2003; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/404,891 dated Oct. 11, 2002; 5 pages.
U.S. Appl. No. 09/404,891: "Method, Architecture and Circuitry for Controlling Pulse Width in a Phase and/or Frequency Detector," Scott et al.; 17 pages.

USPTO Notice of Allowance for U.S. Appl. No. 10/226,911 dated Aug. 20, 2004; 4 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/226,911 dated Mar. 19, 2004; 6 pages.
U.S. Appl. No. 10/226,911: "Calibration of Integrated Circuit Time Constants," Gehring et al.; 32 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/943,149 dated Jan. 12, 2004; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/943,149 dated Aug. 28, 2003; 9 pages.
USPTO Final Rejection for U.S. Appl. No. 09/943,149 dated May 7, 2003; 10 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/943,149 dated Nov. 20, 2002; 7 pages.
U.S. Appl. No. 09/943,149: "Method for Phase Locking in a Phase Lock Loop," Moyal et al; 21 pages.
Durham et al., "Integrated Continuous-Time Balanced Filters for 16-bit DSP Interfaces," IEEE, 1993; 6 pages.
Durham et al., "Circuit Architectures for High Linearity Monolithic Continuous-Time Filtering," IEEE, 1992; 7 pages.
Durham et al., "High-Linearity Conitnuous-Time Filter in 5-V VLSI CMOS," IEEE, 1992; 8 pages.
U.S. Appl. No. 09/047,595: "Roving Range Control to Limit Receive PLL Frequency of Operation," Scott; 35 pages.
U.S. Appl. No. 09/216,460: "Circuit and Method for Controlling an Output of a Ring Oscillator," Abugharbieh et al.; 21 pages.
U.S. Appl. No. 09/471,914: "Reference-Free Clock Generator and Data Recovery PLL," Dalmia et al.; 32 pages.
U.S. Appl. No. 09/471,576: "Reference-Free Clock Generation and Data Recovery PLL," Dalmia; 30 pages.
U.S. Appl. No. 10/083,442: "Method/Architecture for a Low Gain PLL with Wide Frequency Range," Meyers et al.; 28 pages.
U.S. Appl. No. 09/470,665: "Digital Phase/Frequency Detector, and Clock Generator and Data Recovery PLL Containing the Same," Dalmia; 26 pages.
U.S. Appl. No. 09/893,161: "Architecture of a PLL with Dynamic Frequency Control on a PLD," Moore; 32 pages.
U.S. Appl. No. 09/608,753: "PLL Lockout Watchdog," Wilson et al.; 24 pages.
U.S. Appl. No. 09/398,956: "Frequency Acquisition Rate Control in Phase Lock Loop Circuits," Moyal et al.; 35 pages.
U.S. Appl. No. 09/747,262: "Linearized Digital Phase-Locked Loop," Williams et al.; 9 pages.
U.S. Appl. No. 09/981,448: "Oscillator Tuning Method," Hauck; 28 pages.
U.S. Appl. No. 09/538,989: "Memory Based Phase Locked Loop," Krishnan; 27 pages.
U.S. Appl. No. 09/048,905: "Programmable Clock Generator," Mann et al.; 42 pages.
U.S. Appl. No. 08/865,342: "Programmable Clock Generator," Mann et al.; 41 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/293,392 dated Mar. 10, 2004; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/293,392 dated Oct. 16, 2003; 6 pages.
U.S. Appl. No. 10/293,392: "Low Voltage Receiver Circuit and Method for Shifting the Differential Input Signals of the Receiver Depending on a Common Mode Voltage of the Input Signals," Maher et al.; 20 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/288,003 dated Jan. 14, 2005; 6 pages.
USPTO Final Rejection for U.S. Appl. No. 10/288,003 dated Oct. 6, 2004; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/288,003 dated Apr. 7, 2004; 9 pages.
U.S. Appl. No. 10/288,003: "Low Voltage Differential Signal Driver Circuit and Method," Roper et al.; 30 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/989,777 dated Jun. 9, 2009; 7 pages.
USPTO Advisory Action for U.S. Appl. No. 11/200,619 dated May 11, 2009; 3 pages.
USPTO Final Rejection for U.S. Appl. No. 11/200,619 dated Mar. 3, 2009; 14 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/200,619 dated Aug. 27, 2008; 13 pages.
U.S. Appl. No. 11/200,619: "Providing hardware independence to automate code generation of processing device firmware," Snyder et al.; 41 pages.
USPTO Notice of Allowance for U.S. Appl. No. 11/201,922 dated Apr. 9, 2009; 4 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/201,922 dated Oct. 21, 2008; 12 pages.
USPTO Final Rejection for U.S. Appl. No. 11/201,922 dated Apr. 30, 2008; 10 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/201,922 dated Oct. 15, 2007; 10 pages.
U.S. Appl. No. 11/201,922: "Design model for a hardware device-independent method of defining embedded firmware for programmable systems," McDonald et al,; 31 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/201,627 dated Dec. 12, 2008; 17 pages.
USPTO Final Rejection for U.S. Appl. No. 11/201,627 dated Apr. 29, 2008; 21 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/201,627 dated Nov. 16, 2007; 16 pages.
U.S. Appl. No. 11/201,627: "Method and an apparatus to design a processing system using a graphical user interface," Ogami et al.; 37 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/989,808 dated Feb. 13, 2006; 4 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,808 dated Oct. 19, 2005; 8 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,808 dated Apr. 14, 2005; 8 pages.
U.S. Appl. No. 09/989,808: "Automatic generation of application program interfaces, source code, interrupts, and data sheets for microcontroller programming," Bartz et al.; 67 pages.
USPTO Notice of Allowance for U.S. Appl. No. 10/109,979 dated Mar. 14, 2006; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 10/109,979 dated Jun. 30, 2005; 6 pages.
U.S. Appl. No. 10/109,979: "Graphical user interface with logic unifying functions," Anderson et al.; 100 pages.
U.S. Appl. No. 09/979,781: "System and method for decoupling and iterating resources associated with a module," Ogami et al.; 40 pages.
U.S. Appl. No. 09/989,775: "User defined names for registers in memory banks derived from configurations," Ogami et al.; 29 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/989,819 dated Jan. 11, 2005; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,819 dated Jul. 13, 2004; 4 pages.
USPTO Miscellaneous Action for U.S. Appl. No. 09/989,819 dated Dec. 14, 2001; 1 page.
U.S. Appl. No. 09/989,819: "System and method for creating a boot file utilizing a boot template," Ogami et al.; 43 pages.
USPTO Notice of Allowance for U.S. Appl. No. 09/989,761 dated Jan. 14, 2005; 6 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,761 dated Aug. 26, 2004; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,761 dated Mar. 10, 2004; 6 pages.
USPTO Final Rejection for U.S. Appl. No. 09/989,761 dated Oct. 3, 2003; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 09/989,761 dated Apr. 18, 2003; 5 pages.
U.S. Appl. No. 09/989,761: "Storing of global parameter defaults and using them over two or more design projects," Ogami et al.; 37 pages.
Wang, et al. "Synthesizing Operating System Based Device Drivers in Embedded Systems," 2003, ACM; 8 pages.
Lutovac et al. "Symbolic Computation of Digital Filter Transfer Function Using MATLAB," Proceedings of 23rd International Conference on Microelectronics (MIEL 2002), vol. 2 NIS, Yugoslavia; 4 pages.

Nouta et al. "Design and FPGA-Implementation of Wave Digital Bandpass Filters with Arbitrary Amplitude Transfer Characteristics," Proceedings of IEEE International Symposium on Industrial Electronics; 1998, vol. 2; 5 pages.
Xilinx, Virtex-II Pro Platform FPGA Developer's Kit, "How Data2BRAM Fits in with Hardware and Software Flows," Chapter 2: Using Data2BRAM; Jan. 2003 Release; 2 pages.
PCT Preliminary Report on Patentability (Chapter 1 of the Patent Cooperation Treaty), PCT/US2005/028793, filed Aug. 12, 2005, mailed Dec. 21, 2007; 2 pages.
PCT Written Opinion of the International Searching Authority for PCT/US2005/028793, fled Aug. 12, 2005, mailed Nov. 19, 2007; 7 pages.
PCT International Search Report of the International Searching Authority for PCT/US05/28793, filed Aug. 12, 2005, mailed Nov. 19, 2007; 5 pages.
International Search Report and Written Opinion of the International Searching Authority for PCT/US05/28898, filed Aug. 12, 2005, mailed Mar. 6, 2007; 6 pages.
Burogs et al., "Power Converter Analysis and Design using Matlab: A Transfer Function Approach," Proceedings of IEEE International Symposium on Industrial Electronics 1998, vol. 2; 6 pages.
Efstathiou, "Analog Electronics: Basic Circuits of Operational Amplifiers," <http://web.archive.org/web/20021231045232> Dec. 31, 2002, version, retrieved from the Internet Archives; 10 pages.
PCT International Search Report for PCT/US05/28791, filed Aug. 12, 2005, mailed Mar. 31, 2008; 4 pages.
PCT International Written Opinion for PCT/US05/28791, filed Aug. 12, 2005, mailed Mar. 31, 2008; 8 pages.
Kory Hopkins, "Definition;" Jan. 16, 1997; <http://www.cs.sfu.ca/cs/people/GradStudent.html>: 1 page.
Ebeling et al., "Validating VLSI Circuit Layout by Wirelist Comparison;" Sep. 1983; in proceedings of the IEEE International Conference on Computer Aided Design (ICCAD-83); 2 pages.
"The Gemini Netlist Comparison Project;" <http://www.cs.washington.edu/research/projects/lis/www/gemini/gemini.html> larry@cs.washington.edu; 2 pages.
Ohlrich et al., "Sub-Gemini: Identifying Subcircuits using a Fast Subgraph Isomorphism Algorithm;" Jun. 1993; in proceedings of the 30th IEEE/ACM Design Automation Conference; 7 pages.
Ebling, "Gemini II: A Second Generation Layout Validation Program;" 1988; in proceedings of the IEEE International Conference on Computer Aided Design (ICCAD-88); 4 pages.
U.S. Appl. No. 12/132,527: "System and Method for Performing Next Placements and Pruning of Disallowed Placements for Programming an Integrated Circuit;" Ogami et al.; 44 pages.
U.S. Appl. No. 12/356,468: "System and Method for Dynamically Generating a Configuration Datasheet," Anderson et al,; filed on Jan. 20, 2009; 27 pages.
U.S. Appl. No. 11/273,708: "Capacitance Sensor Using Relaxation Oscillators," Snyder et al.; 33 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/273,708 dated Mar. 19, 2007; 16 pages.
USPTO Final Rejection for U.S. Appl. No. 11/273,708 dated Jul. 5, 2007; 8 pages.
USPTO Notice of Allowance for U.S. Appl. No. 11/273,708 dated Aug. 9, 2007; 4 pages.
U.S. Appl. No. 11/337,272: "Successive Approximate Capacitance Measurement Circuit;" Snyder; 29 pages.
USPTO Requirement for Restriction/Election for U.S. Appl. No. 11/337,272 dated Sep. 11, 2006; 5 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/337,272 dated Oct. 24, 2006; 9 pages.
USPTO Final Rejection for U.S. Appl. No. 11/337,272 dated Feb. 2, 2007; 11 pages.
USPTO Advisory Action for U.S. Appl. No. 11/337,272 dated Apr. 3, 2007; 3 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/337,272 dated May 17, 2007; 11 pages.
USPTO Notice of Allowance for U.S. Appl. No. 11/337,272 dated Aug. 15, 2007; 9 pages.
U.S. Appl. No. 11/983,291: "Successive Approximate Capacitance Measurement Circuit," Snyder; 26 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/983,291 dated Mar. 9, 2099; 9 pages.
U.S. Appl. No. 11/698,660: "Configurable Bus," Kutz et al.; 35 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/698,660 dated Dec. 2, 2008; 12 pages.
USPTO Final Rejection for U.S. Appl. No. 11/698,660 dated May 28, 2009; 12 pages.
U.S. Appl. No. 11/709,866: "Input/Output Multiplexer Bus," Dennis Sequine; 33 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/709,866 dated Nov. 7, 2008; 14 pages.
USPTO Notice of Allowance for U.S. Appl. No. 11/709,866 dated Apr. 7, 2009; 8 pages.
Sedra et al., "Microelectronic Circuits," 3rd Edition, Oxford University Press; 20 pages.
Van Ess, David; "Simulating a 555 Timer with PSoC," Cypress Semiconductor Corporation, Application Note AN2286, May 19, 2005; 10 pages.
Cypress Semiconductor Corporation, "FAN Controller CG6457AM and CG6462AM," PSoC Mixed Signal Array Preliminary Data Sheet; May 24, 2005; 25 pages.
Cypress Semiconductor Corporation, "PSoC Mixed-Signal Controllers," Production Description; <http://www.cypress.com/portal/server>; retrieved on Sep. 27, 2005; 2 pages.
Cypress Semiconductor Corporation, "CY8C21x34 Data Sheet," CSR User Module, CSR V.1.0; Oct. 6, 2005; 36 pages.
Chapweske, Adam; "The PS/2 Mouse Interface," PS/2 Mouse Interfacing, 2001; 11 pages.
Cypress Semiconductor Corporation, "Cypress Introduces PSoC(TM)-Based Capacitive Touch Sensor Solution," Cypress Press Release; May 31, 2005; <http://www.cypress.com/portal/server>; retrieved on Feb. 5, 2007; 4 pages.
Seguine, Ryan; "Layout Guidelines for PSoC CapSense," Cypress Semiconductor Corporation, Application Note AN2292; Jul. 22, 2005; 13 pages.
Lee, Mark; "EMC Design Considerations for PSoC CapSense Applications," Cypress Semiconductor Corporation, Application Note AN2318; Sep. 16, 2005; 6 pages.
Cypress Semiconductor Corporation, "Release Notes sm017," Jan., 24, 2007; 3 pages.
Cypress Semiconductor Corporation, "PSoC CY8C20x34 Technical Reference Manual (TRM)," PSoC CY8C20x34 TRM, Version 1.0, 2006; 220 pages.
international Search Report for International Application No. PCT/US2006/09572 dated Jan. 10, 2008; 2 pages.
International Written Opinion of the International Searching Authority for International Application No. PCT/US2006/09572 dated Jan. 10, 2008; 5 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/865,672 dated Jul. 17, 2009; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/859,547 dated Oct. 1, 2009; 9 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/967,243 dated Sep. 17, 2009; 9 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/967,240 dated Jun. 10, 2009; 7 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/857,947 dated Mar. 30, 2009; 18 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 12/104,672 dated Aug. 26, 2009; 11 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 12/060,128 dated Apr. 29, 2009; 11 pages.
International Search Report of the International Searching Authority for International Application No. PCT/US08/60695 dated Jul. 22, 2009; 3 pages.
Written Opinion of the International Searching Authority for International Application No. PCT/US08/60695 dated Jul. 22, 2009; 6 pages.
Azim et al., "A Custom DSP Chip to Implement a Robot Motion Controller Proceedings of the IEEE Custom Integrated Circuits Conference," May 1988, pp. 8.7.1-8.7.5; 6 pages.

Catthoor et al., "Architectural Strategies for an Application-Specific Synchronous Multiprocessor Environment," IEEE transactions on Acoustics, Speech, and Signal Processing; vol. 36, No. 2, Feb. 1988, pp. 265-284; 20 pages.
International Search Report of the International Searching Authority for International Application No. PCT/US08/60696 dated Sep. 22, 2008; 2 pages.
International Search Report of the International Searching Authority for International Application No. PCT/US08/60698 dated Sep. 5, 2008; 2 pages.
Shahbahrami et al., "Matrix Register File and Extended Subwords: Two Techniques for Embedded Media Processors," ACM, May 2005; 9 pages.
Jung et al., "A Register File with Transposed Access Mode," 2000, IEEE; 2 pages.
International Search Report of the International Searching Authority for International Application No. PCT/US08/60681 dated Sep. 12, 2008; 2 pages.
Written Opinion of the International Searching Authority for International Application No. PCT/US08/60681 dated Sep. 12, 2008; 4 pages.
USPTO Notice of Allowance for U.S. Appl. No. 11/965,677 dated Sep. 10, 2009; 6 pages.
USPTO Non-Final Rejection for U.S. Appl. No. 11/965,677 dated Mar. 10, 2009; 10 pages.
Written Opinion of the International Searching Authority for International Application No. PCT/US08/60696 dated Sep. 22, 2008; 4 pages.

* cited by examiner

Figure 1

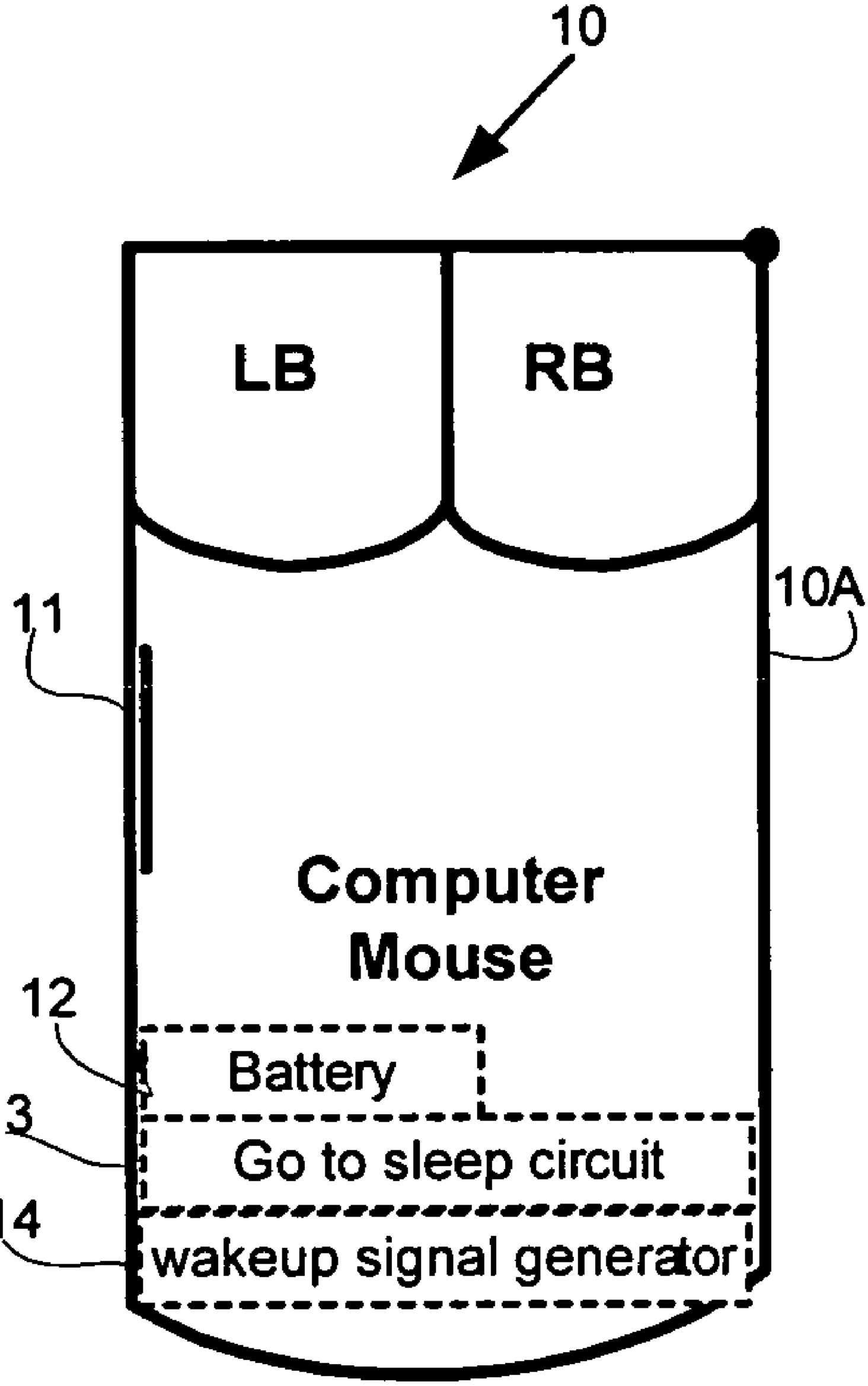

10
LB
RB
11
10A
Computer Mouse
12
Battery
13
Go to sleep circuit
14
wakeup signal generator

Figure 2A

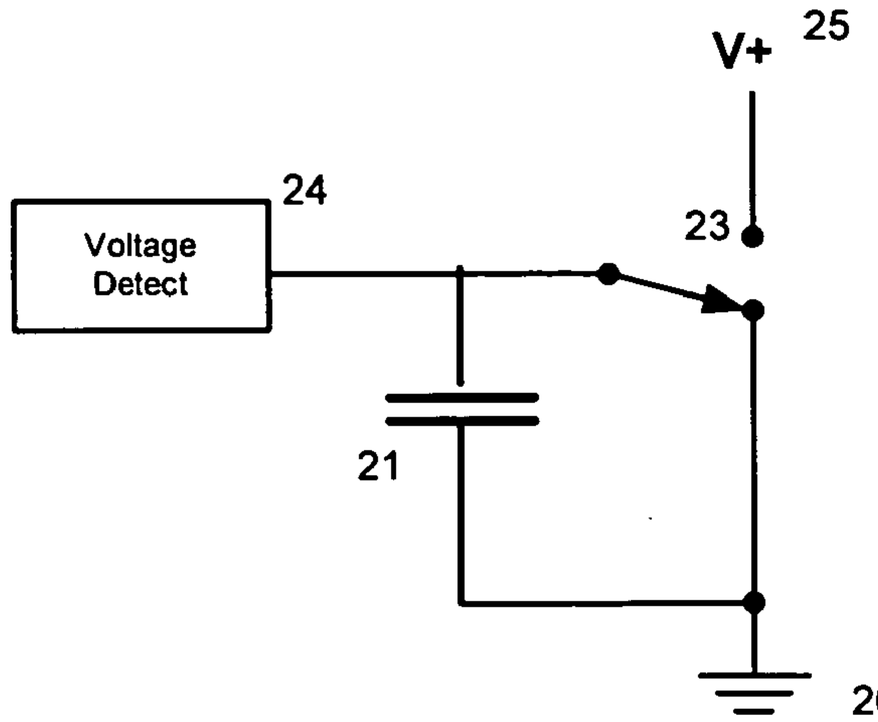


Figure 2B

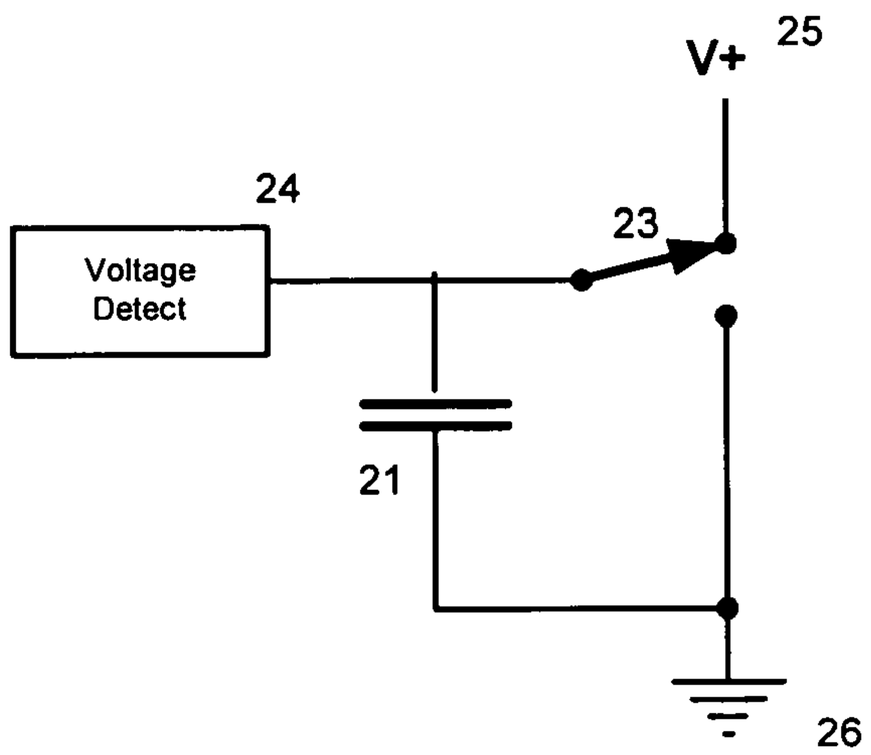


Figure 2C

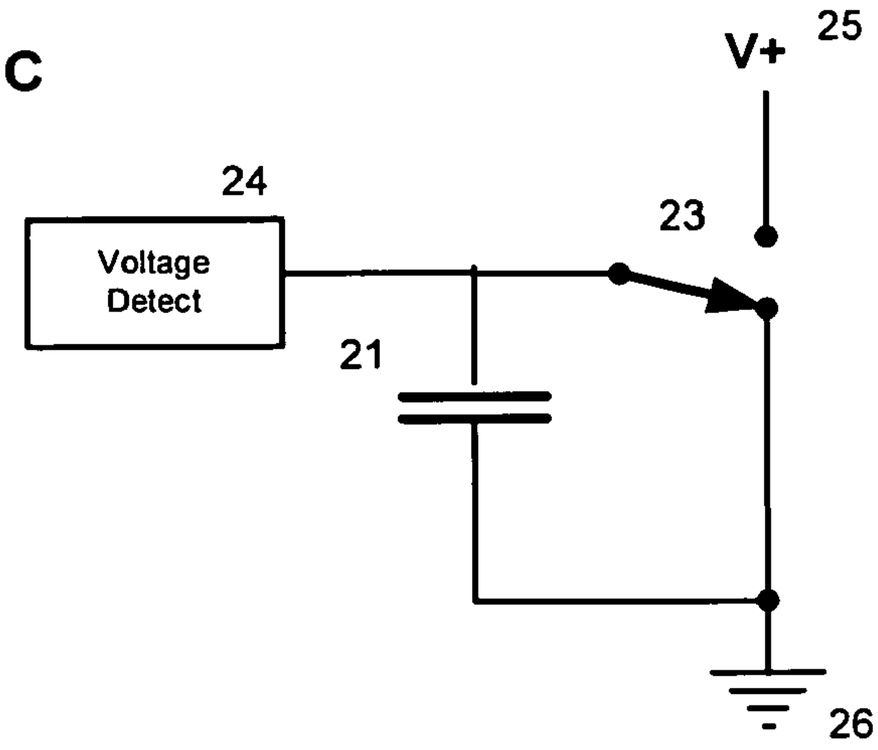


Figure 3

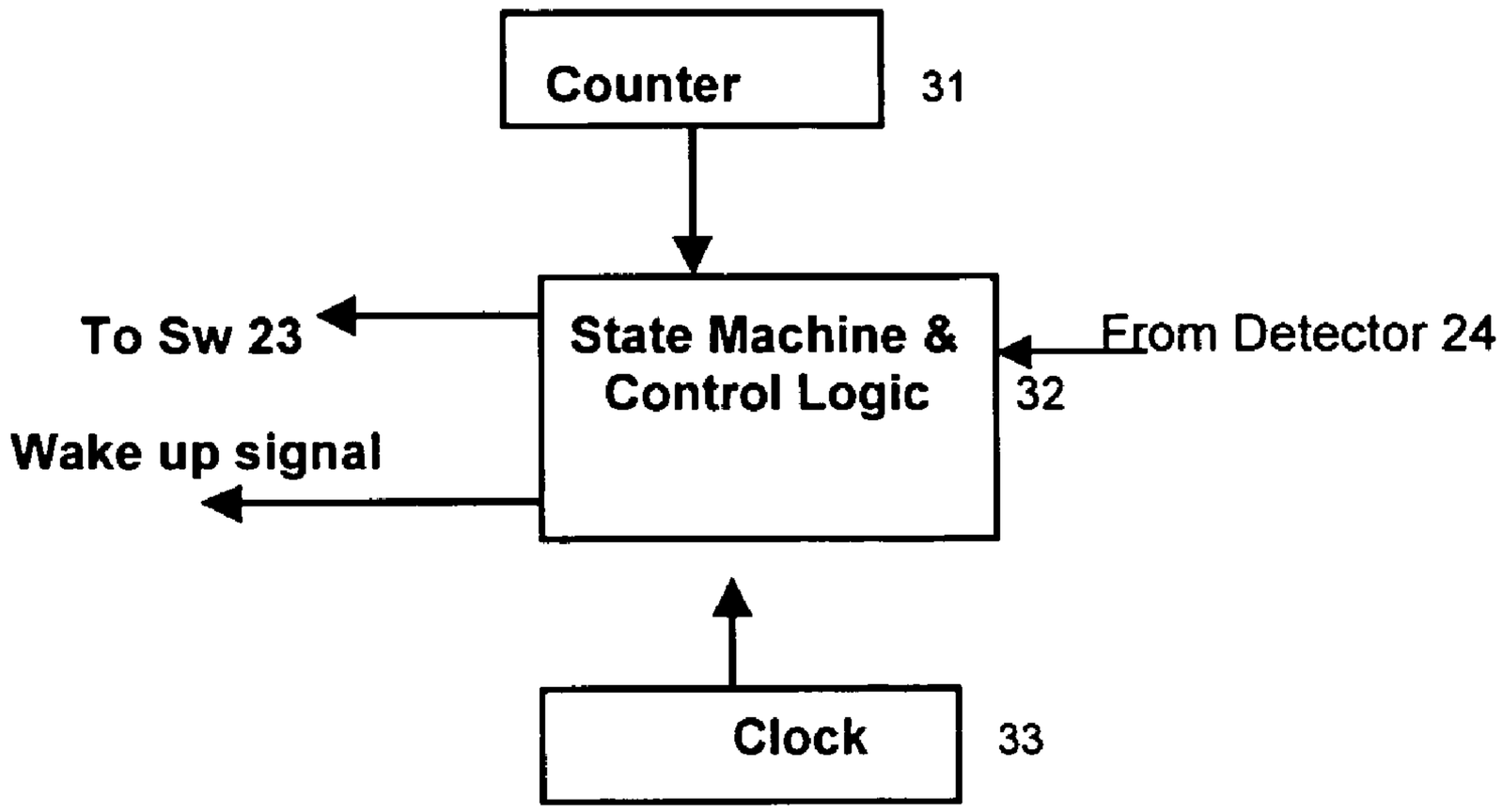
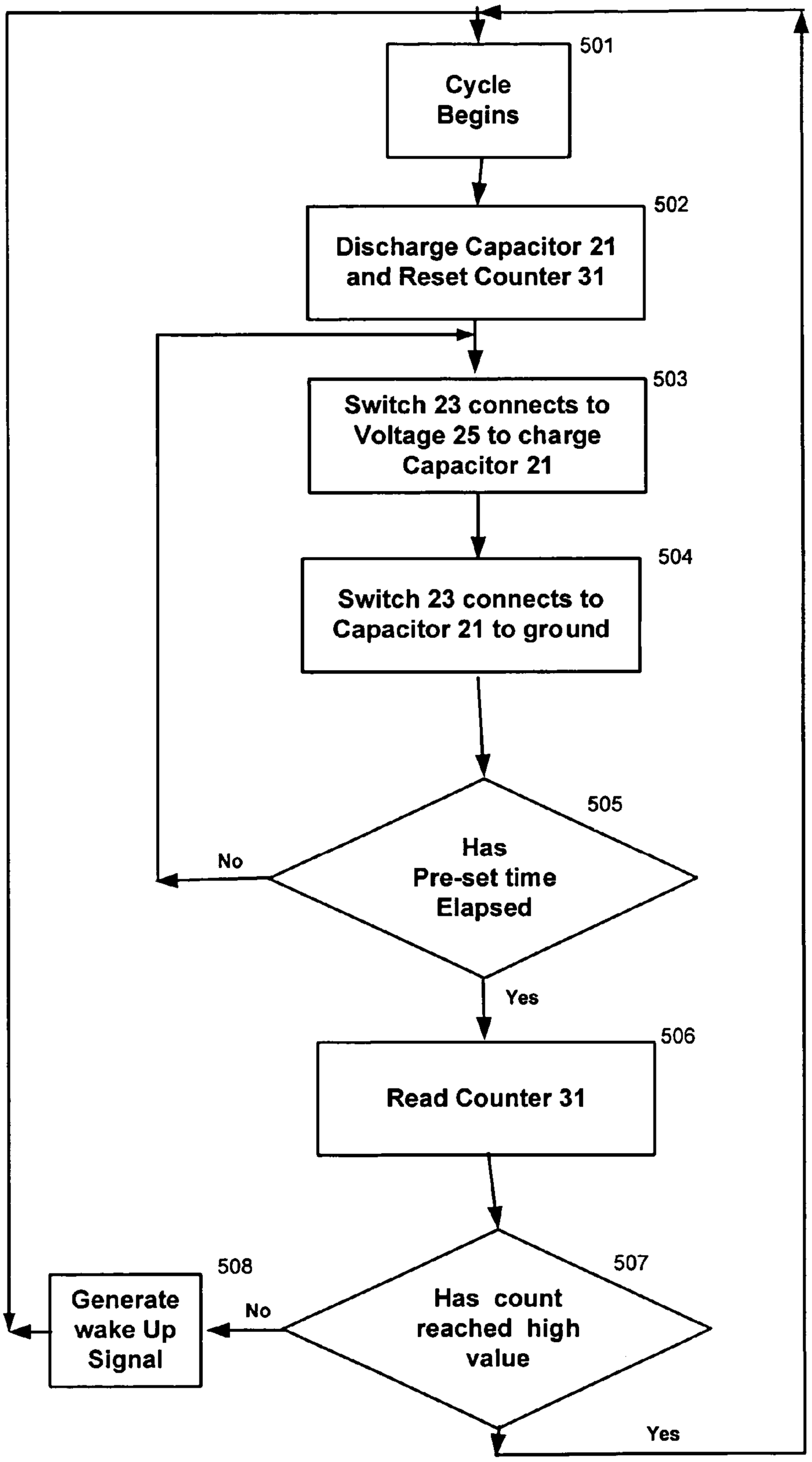


Figure 4

Step	Switch 23	
	Power	Discharge
Reset	0	1
Step 1	1	0
Step 2	0	1
Step 3	1	0
Step 4	0	1
Step 5	1	0
Step 6	0	1
Step 7	1	0
Step 8	0	1
Step 9	1	0
Step x	0	1

Figure 5


501
Cycle Begins
502
Discharge Capacitor 21 and Reset Counter 31
503
Switch 23 connects to Voltage 25 to charge Capacitor 21
504
Switch 23 connects to Capacitor 21 to ground
505
Has Pre-set time Elapsed
No
Yes
506
Read Counter 31
507
Has count reached high value
No
508
Generate wake Up Signal
Yes

TOUCH WAKE FOR ELECTRONIC DEVICES

FIELD OF THE INVENTION

The present invention relates to electronic devices and more particularly to a method and system for activating an electronic device.

BACKGROUND

In many electronic devices there is a need to conserve power. In particular, in battery operated hand held devices, the amount of power available is limited. One technique, frequently used to conserve power, is to have a low power mode. Such a low power mode is frequently referred to as a "sleep mode".

Generally, when a device is in a sleep mode, many of the components in the device are deactivated. Only those components are active that are necessary so that the device can resume a fully operational state without any significant delay. Devices that have a sleep mode must have some mechanism to return the device to an operations state from the sleep power mode. Returning a device to an operational mode from a sleep mode is generally referred to as waking the device.

There are a variety of existing mechanisms for waking electronic devices from a sleep mode. The simplest is a mechanical switch or button, that when pressed, wakes the device. Other known devices include optical or mechanical motion sensors. Such motion sensors can, for example, be used to wake a battery operated wireless mouse when the mouse is moved.

Existing devices for waking hand help battery operated devices have a variety of disadvantages. For example, a button or switch requires a specific physical action on the part of the operator to press the button or switch. Many motion sensors require additional hardware. Finally, many of the existing devices consume what may be a significant amount of power for a very low power device.

Described below are an improved method, system and device for waking a hand held electronic device.

SUMMARY

Described below is a system and method for generating a wakeup signal for a low power device such as a wireless mouse. With the system described herein, the device wakes up as soon as an operator touches it. The system includes a capacitor, the capacitance of which changes when a user touches the device. A metal strip (which is connected as one electrode of a capacitor) is positioned so that an operator seeking to use the device will touch the device in the vicinity of the metal strip; however, there can be a thin insulating layer (such as a mouse casing) between the metal strip and the surface that the operator touches. The value of the capacitance is periodically measured when said device is in a sleep mode. If it is determined that the value of the capacitance is relatively large, it means that an operator is touching the device and a wake up signal is generated. Thus, a wake signal is generated when the operator touches the device.

BRIEF DESCRIPTION OF THE FIGURE

FIG. **1** is an overall diagram of a first embodiment.

FIGS. **2**A, **2**B and **2**C shows the capacitor and switch in the first embodiment.

FIG. **3**, shows the control logic for the switch.

FIG. **4** is a table showing the state of the switch at various steps.

FIG. **5** is a flow diagram showing the operation of the first embodiment.

DETAILED DESCRIPTION

Several preferred embodiments of the present invention will now be described with reference to the accompanying drawings. Various other embodiments of the invention are also possible and practical. This invention may be embodied in many different forms and the invention should not be construed as being limited to the embodiments set forth herein.

The figures listed above illustrate the preferred embodiments of the invention and the operation of such embodiments. In the figures, the size of the boxes is not intended to represent the size of the various physical components. Particular reference numeral is used to denote the same element in multiple figures.

Only those parts of the various units are shown and described which are necessary to convey an understanding of the embodiment to those skilled in the art. Those parts and elements not shown are conventional and known in the art.

FIG. **1** shows a wireless computer mouse **10** that is battery operated by a battery **12**. As is conventional, the mouse **10** has a plastic shell or casing **10**A and right and left buttons designated LB and RB in the figure. The mouse **10** includes conventional circuitry **13** that puts the mouse into a low power, sleep mode, when the mouse is not used for a pre-specified period of time. Such circuitry, that puts a device in a sleep mode, is conventional in devices where it is important to save battery power. In the normal wake mode, the mouse **10** generates radio signals to communicate with a host. In the sleep mode this transmitter is turned off, thereby conserving power.

Mouse **10** includes a special circuit **14**, described in detail below, which produces a signal to wake the mouse **10** when the mouse is merely touched by the user. The mouse **10** has a conductive strip **11** that activates the wakeup circuit in a manner that is described below.

It should be understood that, in other embodiments, device **10** could be a device other than a wireless mouse. For example device **10** could be a cell phone or a portable media player and the circuitry described below could be used to active the display or to turn on the backlight for a display.

The conductive pad **11** is positioned inside the mouse casing **10**A at a location where a user would normally place a finger on the casing when the device is being used. The mouse casing **10**A is a conventional plastic mouse casing that is about one millimeter thick. The conductive pad **11** functions as a capacitor the capacitance of which changes when a users finger touches the case as the location where the strip is located.

While this first embodiment includes a single conductive pad **11**, other embodiments include two or more such conductive pads at locations where a user is likely to place a finger when using the device.

The wakeup signaling circuitry in device **10** includes a capacitor and switch as shown in FIGS. **2**A, **2**B and **2**C and control and logical circuitry as shown in FIG. **3**. FIG. **4** is a flow diagram illustrating the operation of the device. Some of the basic principles of operation will first be described with references to FIGS. **2**A, **2**B and **2**C and then, the actual operation of the system will be explained with reference to FIGS. **3** and **4**.

FIGS. **2**A, **2**B and **2**C, shown the variable capacitor **21** (which is formed by the conductive strip **11**), a switch **23**, a voltage supply **25**, and a voltage measuring circuit **24**.

Capacitor **21** is a variable capacitor, the capacitance of which is changed when the operator touches the mouse **11** at the location where pad **11** is located. The conductive strip **11** functions as a capacitor. When the operator's finger touches the mouse **10** at a location near the conductive strip **11**, the value of capacitor **21** is increased.

The second electrode of capacitor **21** is effectively connected to ground **26** as illustrated in the figures. Switch **23** can connect the first electrode of capacitor **21** to either voltage source **25** or to ground **26**. When capacitor **21** is connected to voltage source **25**, it is charged and when it is connected to ground **26**, it is discharged. It is noted that switch **23** is a conventional transistor switch.

In the specific embodiment described here, the voltage source **25** is a three-volt supply. The value of capacitor **21** depends on the size of the strip **11**, and of importance to the operation of the circuit is the amount of change in capacitance when an operator touches the device near the strip **11**. In the specific embodiment described here, the strip **11** is one inch long and a half in inch wide and the casing **11**A, which forms a dielectric for the capacitor is one-millimeter thick. With such a configuration, the capacitance of capacitor **21**, is about doubled when the operator places a finger on the device. However, the exact capacitance is a matter of detailed engineering design.

It is noted that the values given above are merely nominal exemplary values. What is essential for the device to operate properly is that the capacitance of capacitor **21** significantly change when an operator places a finger on the device.

The device operates as follows: The first step is a reset step during which the capacitor **21** is discharged. Closing switch **23** connects both electrodes of capacitor **21** to ground **26** and discharges capacitor **21**. FIG. **2**A illustrates the circuit with switch **23** in a position to discharge the capacitor **21**.

Next switch **23** is connected to the positive voltage **25**. The circuit with switch **21** connected to voltage **25** is shown in FIG. **2**B. When switch **23** is connected to the positive voltage **25**, capacitor **21** is charged. The amount of charge that can be stored in capacitor **21** when switch **23** is connected to voltage **25**, and thus the amount of time required to charge the capacitor to a pre-established value depends upon the size of capacitor **21**. That is, more charge is stored on capacitor **21** and more time is required to charge capacitor **21**, when the operator has a finger near strip **11**, thereby increasing the capacitance of capacitor **21**. Voltage detector **24** detects when the voltage on capacitor **21** reaches a pre-established value indicating that it is charged. For example if voltage supply **25** is a 3.3 volt supply, the pre-established value detected by circuit **24** could, for example, be three volts.

In the third step in the operation, the switch **23** is connected to ground **26**. When this occurs, the capacitor **21** is discharged. Naturally, when capacitor **21** is in its high value state, more time will be required to discharge the capacitor. Circuit **24** detects when the capacitor **21** has been substantially fully discharges and the voltage at the terminal of the capacitor is substantially 0. What constitutes the exact fully discharged voltage is a matter of engineering design. In general it will be a voltage slightly above 0 volts.

After the capacitor **21** is discharged, switch **23** is re-connected to the voltage **25** as shown in FIG. **2**B. When capacitor **21** is again charged the switch **23** is again switched to the position illustrated in FIG. **2**C so that capacitor **21** can again be discharged.

The process is repeated many times, that is, switch **23** is moved between the positions shown in FIGS. **2**B and **2**C repeatedly for a fixed period of time. For example, the cycle may be repeated for 3 milliseconds.

The number of cycles that occur within the fixed period of time, indicates whether or not the operator's finger is located on the device, where conductive strip **11** is located.

The value of capacitor **21** is determined by whether or not an operator has a finger (or hand) near conductive strip **11**. Thus, when the operator has a finger or hand near conductive strip **11**, capacitor **21** has a relatively high value of capacitance, and less cycles occur during the fixed time period.

By counting the number of cycles that occur in the fixed period of time, the system can determine whether or not, the operator has a finger touching conductive strip **11**. If device **10** is in a low power sleep mode, and the system determines that the operator has placed a finger on conductive strip **11**, a wake up signal is generated.

The circuitry that controls switch **23** is shown in FIG. **3**. It includes a counter **31**, state machine and control logic **32** and a clock **33**. The state machine control logic **32** has an output that control switch **23** and an output for the wakeup signal. This wake up signal goes to conventional wake up logic.

The table in FIG. **4** shows the cycles through which the circuit operates under control of state machine and control logic **32**. The logical circuitry and the state machine in circuit **32** are conventional. The table in FIG. **4** has three columns. The first column indicates a step of the state of state machine in unit **32**. There are two columns for switch **23**. The first column under switch **23** indicates when the switch **23** is connected to the power source **25**. A "1" in the first column under switch **23** indicates that switch **23** is connected to the voltage source **25** and it is thereby charging capacitor **21**. A "0" in the first column under switch **23** indicates that switch **23** is not connected to the voltage source **25**.

The second column under switch **23** indicates whether or not switch **23** is connected to ground **26**. A "1" in the second column under switch **23** indicates that switch **23** is connected to ground **26** and that charge can flow from capacitor **21** to ground to discharge the capacitor. A "0" in the second column under switch **23** indicates switch **23** is not connected to ground **26**.

A cycle begins with a reset step (indicated by the first line of the table in FIG. **4**). During this step capacitor **21** is discharged.

Next there are a series of steps indicated as steps:"1" to "x" in FIG. **4** during switch **23** alternates between being connected to voltage source **25** and being connected to capacitor **22**. During each of these steps, capacitor **21** is first charged and then the charge on capacitor **21** is transferred to ground **26**.

Detector **24** detects when the capacitor **21** is fully charged, and this terminates each charging step. Detector **24** also detects when capacitor **21** is discharged and this terminates each discharge step. Counter **21** counts the number of steps or cycles that occur during a pre-set amount of time indicated by clock circuit **33**. If the number of cycles counted by counter **21** in the preset time interval is relatively small, it indicates that the value of capacitor **21** is relatively large. This means that the operator's finger is on or near pad **11**. If the number of cycles counted by counter **21** is relatively large, it means that the value of capacitor **21** is relatively small and that the operator's finger is not near the pad **11**.

In the preferred embodiment, the capacitance of pad **11** is checked three times every second. Each check requires about 3 microseconds. Thus, when the mouse is in sleep mode, the

circuitry is only active for about nine microseconds in each second. When the mouse is not in sleep mode, no checks are made.

FIG. **5** is a flow diagram showing the operation of the circuit. The operation is continuous and as indicated above, a new cycle is initiated every one third of a second. That is, there are three cycles per second. Clock circuit **33** controls this in a conventional manner. Block **501** indicates the beginning of a cycle. As indicated by block **502**, as a preliminary step, switch **23** is connected to ground **26** to discharges capacitor **21**. The switch **24** is closed for a period of time sufficient to discharge capacitor **21**. During this reset step counter **31** is also set to zero.

Next as indicated by block **503**, switch **23** is connected to voltage source **25**. This allows capacitor **21** to charge. The switch is connected to voltage source **25** for a sufficient time to allow capacitor **21** to essentially fully charge. Detector **24** determines when the capacitor is fully charged. When detector **24** determines that the capacitor is fully charged, the process moves on to the next step.

Switch **23** is next connected to ground **26** as indicated by block **504**. This transfers the charge from capacitor **21** to ground and discharges the capacitor. Again the switch is left connected to capacitor **22** for an amount of time determined by detector **24**. That is, detector **24** determines when capacitor **21** has been discharged and the system can move on to the next step.

A test is then made (by circuit **32**) to determine if a pre-specified time has expired. If the time has not expired, the process returns to block **503**. If the time has expired, counter **31** is read as indicated by block **506**. As indicated by block **507**, a test is made to determine if the counter has reached a pre-established high value. If the counter has reached a high value the process returns to block **501** because this means that the operator has not touched the device.

If the count in counter **31** is relatively low, it means that the operator has touched the device near strip **11**, and a wake up signal is generated as indicated by block **508**.

As an example, the difference in the count between when an operator has a finger or hand near the area whether step **11** is located and when no hand is present may be the difference between a count of 100 and 200 if the capacitance is doubled by the presence of a hand.

It is noted that herein the term "operator's finger is used to mean any part of the operator's hand. Thus, the term operator's finger means any part of the operator's hand that is placed on the device **10** in the vicinity of strip **11**. The wake up signal is generated by the above circuit when any part of the operator's body is placed on device **10** in the vicinity of strip **11**. As used herein, an operator touches a device by placing any part of a hand on the device in the vicinity of strip **11** or in other embodiments with multiple strips, in the vicinity of any one of the strips.

The embodiment described above utilizes a particular method of determining the capacitance. It is noted that in other embodiments, other techniques for measuring capacitance are used.

While the invention has been shown and described with respect to preferred embodiments thereof, it should be understood that a wide variety of other embodiments are possible without departing from the scope and sprit of the invention. The scope of the invention is only limited by the appended claims.

We claim:

1. A system comprising:

a capacitance measurement circuit that includes only one capacitance sensor, wherein the capacitance sensor comprises a first conductive strip positioned adjacent to an interior surface of a casing of a device, beneath an area of an external surface of the casing touched by a user, wherein the conductive strip forms a capacitor, a capacitance of which is increased when the user touches the exterior surface of the casing;

a switch coupled to the capacitor, the switch to alternately couple the capacitor to a voltage source to charge the capacitor and to a ground supply to discharge the capacitor;

a detector circuit coupled to the capacitor, the detector circuit to determine when the capacitor reaches a pre-set charge and when the capacitor is fully discharged;

a control circuit coupled to the detector circuit, the control circuit responsive to the detector circuit to alter a position of the switch, wherein the position is altered when the capacitor reaches the pre-set charge and when the capacitor is fully discharged;

a counter coupled to the control circuit, the counter to count a number of times the position of the switch is altered in a pre-established period of time and compare the number of times the position of the switch is altered to a pre-established count value; and

a signal generator circuit coupled to the counter, the signal generator circuit to generate a signal to wake the device from a sleep state if the number of times the position of the switch is altered does not match the pre-established count value during the pre-established period of time.

2. The system of claim **1**, wherein the number of times the position of the switch is altered is inversely related to the capacitance of the capacitor.

3. The system of claim **1**, wherein the device is battery operated.

4. The system of claim **3**, wherein the device is a computer mouse.

5. The system of claim **1**, wherein the casing comprises a non-conductive material.

6. The system of claim **5**, wherein the casing comprises a dielectric for the capacitor.

7. The system of claim **1**, wherein the pre-set charge is a charge that generates a voltage of approximately three volts.

8. The system of claim **1**, wherein fully discharged comprises a voltage of approximately zero volts.

9. The system of claim **1**, wherein the control circuit comprises a clock and a state machine.

10. A method of generating a wakeup signal for a device, the method comprising:

sensing, by a capacitance measurement circuit, a capacitance value, wherein the capacitance measurement circuit includes only capacitance sensor, wherein the capacitance sensor comprises a first conductive strip located adjacent to an interior surface of a casing of the device, wherein the conductive strip forms a capacitor;

changing a capacitance value of the capacitor from a relatively low value to a relatively high value when a user touches an exterior surface of the casing;

alternately charging the capacitor to a pre-set charge and fully discharging the capacitor;

counting a number of cycles for the capacitance value to reach the pre-set charge and to be fully discharged in a pre-established period of time and comparing the number of cycles to a pre-established count value; and

generating the wakeup signal for the device if the number of cycles does not match the pre-established count value during the pre-established period of time.

11. The method of claim **10**, wherein the number of cycles is inversely related to the capacitance value of the capacitor.

12. The method of claim 10, wherein charging the capacitor comprises setting a position of a switch to couple the capacitor to a voltage source.

13. The method of claim 12, wherein discharging the capacitor comprises altering the position of the switch to couple the capacitor to a ground supply.

14. The method of claim 13, further comprising:

altering the position of the switch when the capacitance value reaches the pre-set charge and when the capacitor is fully discharged.

15. The method of claim 10, wherein the device is a battery operated wireless computer mouse which goes into a sleep state when not moved for a particular period of time.

16. The method of claim 10, wherein the casing comprises a non-conductive material.

17. A system comprising:

a capacitance measurement circuit that includes conductive means forming only one capacitor, wherein the conductive means are positioned adjacent to an interior surface of a casing of a device, and wherein a capacitance value of the conductive means is increased from a relatively low value to a relatively high value when the user touches an exterior surface of the casing of the device;

counting means coupled to the conductive means, the counting means for determining a number of cycles where the capacitor is charged to a pre-set charge and is fully discharged in a pre-established period of time and comparing the number of cycles to a pre-established count value; and

circuit means coupled to the counting means, the circuit means for generating a signal to wake the device from a sleep state if the number of cycles does not match the pre-established count value, and if the capacitor has a relatively high value.

18. The system of claim 17, wherein the number of cycles is inversely related to the capacitance value of the capacitor.

* * * * *